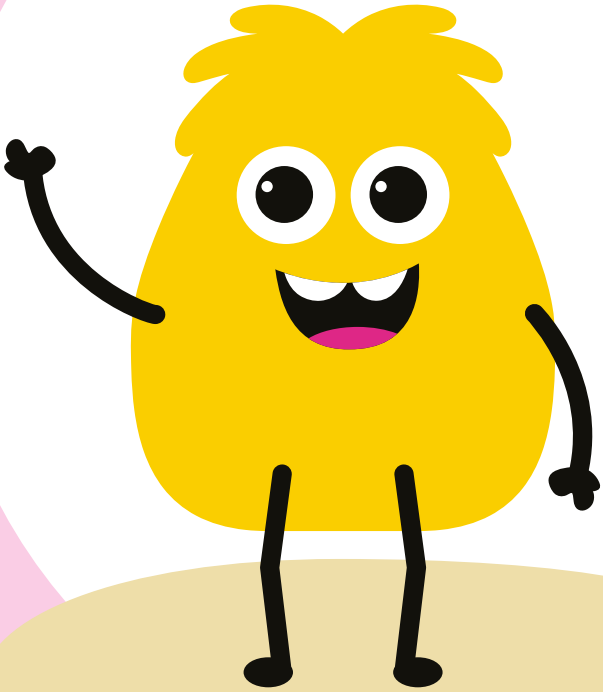
British Science Week

Teacher Pack

Welcome



Thank you for signing up for more information about our virtual British Science Week event. We're really looking forward to releasing our content for 2024!

Here's how it will work.

There will be five days of online content, each of which will be released at midnight, starting on Monday 11th March.

Each day will be hosted by Zainab, Callum or Dan who are current BT apprentices or graduates. They will be give an overview of the topics being covered at the start of each day.

This year we're covering a broad range of topics. We'll take a look at how all of these subject areas require STEM-based skills, whilst also looking at the exciting technology and careers that are involved:

- **Monday -** Security: Social Engineering
- **Tuesday -** Networks: 5G
- **Wednesday -** People: Diversity & Inclusion
- **Thursday -** Connected Devices: Internet of Things (IoT)
- **Friday -** Artificial Intelligence (AI): ChatBSW

The content for each day will have a combination of videos, activities, and profile cards, with a live Q&A panel to finish the week.

The Q&A session will be a great opportunity for you and your students to pose questions to world leading experts and also meet some Gatsby measures. They will submit questions via a moderated chat and the host (Carol, BT) will ask the panellists to answer. Those panellists are listed further down in this pack.

The kit list for the activity packs can be found on page 10 of this briefing pack.

We really hope you find the content useful. We'd love to see you all getting involved as well so please send any pictures of you, your students or class watching the videos, reading the content or getting stuck in with the activities. Email these to us at computerscience@bt.com or post on social media and tag in @adastralpark with the hashtag #BSW24.

Don't forget that our content from previous events such as British Science Week 2023, 2022, 2021 and Norwich Science Festival 2021 is also still available for you to use:

- British Science Week 2023
- British Science Week 2022
- British Science Week 2021
- Norwich Science Festival

If you have any questions about any of the content, please reach out and email us on computerscience@bt.com.

Thanks again, and we really hope you enjoy the content starting on Monday 11th March.

The full activity packs are included from page 13 in this briefing pack, as well as a comprehensive kit list on page 10. However, the following pages give you some introductory text for each day and some idea as to what to expect in the activities, plus some extra info for setup and preparation.

Monday 11th March

Security: Social Engineering

Introduction
Social engineering is a fascinating subject that delves into human psychology, focusing on our behaviours when interacting with one another. Imagine being able to influence people's thoughts, behaviours, or decisions without them realising – that's the essence of social engineering.

While it might sound like something out of a spy movie, social engineering is very real. It is a technique employed by criminals to manipulate others for various purposes.

Today's content for British Science Week has focused on data security. Social engineering from this perspective is the art of criminals targeting our human psychology. More specifically exploiting the trust we place in other people that makes us feel safe enough to share our personal information with them. Alternatively, it can be capitalising on our natural human tendencies, such as the desire to help or the fear of missing out.

Acquiring information like this allows the scammers to illegally gain access to personal information, computer systems, or get at our confidential data like passwords or bank details.
It doesn't involve hacking into computers or using complex algorithms; instead, it relies on understanding how people think and react in certain situations. This makes it particularly dangerous in our digitally connected world, where personal information is freely shared online.

Learning about social engineering not only increases your knowledge about cybersecurity and cybercrime, but it also enables you to be better prepared to tackle every day social interactions you have online and face-to-face.

Be wary out there, not everyone is as trustworthy as they may seem!

Activities
Activity One (Cyber Live) has been provided by Grok Academy (the supporting organisation for the first day of #BSW2024).

This is a self-contained, all-online activity which can be done individually or in pairs.

It is an online activity made up on many individual exercises to free the captain who's been locked down into a room of a fictitious ship called HMAS Vampire. Having a pen and paper nearby is worthwhile to capture some information you pick up as you work your way through the exercises.

Exercises range from watching videos, solving cyphers, finding hidden messages in digital assets and socially engineering information from fake social media profiles. It guides you through and is presented in an easy-to-use and understand fashion.

If you do require any help on how to complete a task or progress through various exercises then please reach out to us at computerscience@bt.com and we will get back to you.

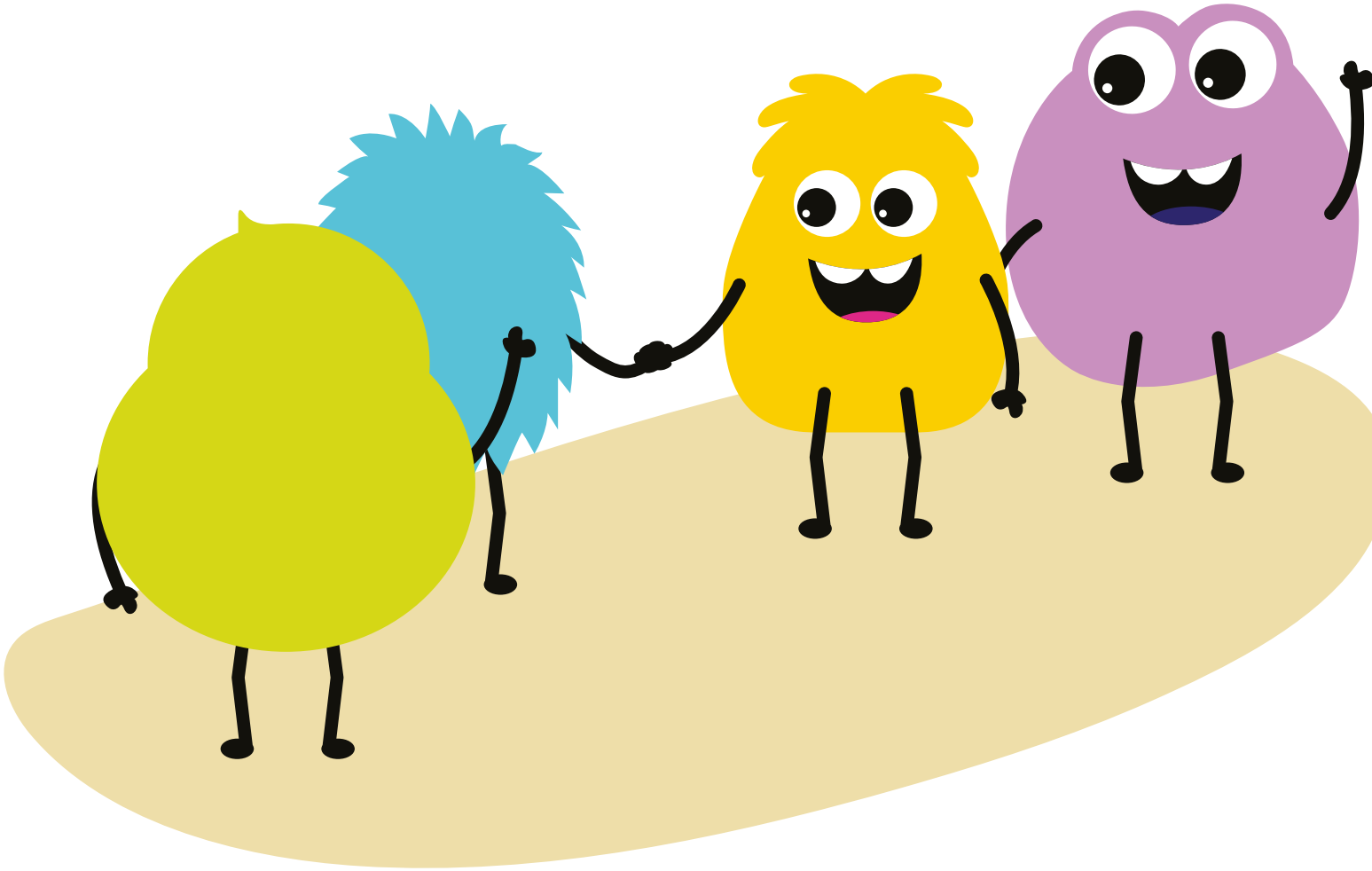
Activity Two (Know Your Risks) has also been provided by Grok Academy.
This activity is best performed in small groups of 3-4, or for the entire class to do together as it requires discussion between students.

There is a 6-page template for this activity which should be printed double-sided leaving you with 3 pages of cards (25 in total). These need to be cut out individually - they are positioned so that printing double-sided leaves you with the picture side and information side of the same card all lined up.

The picture side lists a category of information e.g. Name, Address, Age etc. The aim is to go through all of the cards, looking at the picture side, and decide whether they are: Ok to share online, should be shared with caution or should NOT be shared online.

The information side of the card will have the answer as to which category it should be in, as well as an explanation as to why.

The discussion element comes in here. Do students agree or disagree with these categorisations and importantly, why do they agree or disagree.



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Or post it on social media and mention @adastralpark with the hashtag #BSW24.

Activity Three (Profile Check-up) has also been provided by Grok Academy.

This activity is best performed individually or in pairs.

There is a worksheet to be printed for this as students will need to circle/label the 5 pieces of personal information that 'Belinda' has shared, that shouldn't have been posted online.

To complete this, students should attempt to use what they've learned from Activity 2.

If you would like to see what the answers are then please reach out to us at computerscience@bt.com and we will send them back to you.

Activity Four (The Phisherman & Staying Safe Online) have been provided by Barefoot Computing at School (The Phisherman) and BT (Staying Safe Online).

This activity is best done individually as both courses are designed to be fun, interactive training modules.

'The Phisherman' is aimed at students aged 7-11 and 'Staying Safe Online' for students 12+.

Activity Five (Scam Detective) has also been provided by Grok Academy.

This activity is best done individually or in pairs.

There are two worksheets to print out for this activity, ideally in colour, as the bright colours form part of the scam to entice you into reading the example phishing emails or smishing texts.

For each of the four examples across the two worksheets, students should identify where the red flags exist which could therefore indicate that they are a scam (phishing or smishing).

There is space on the worksheet for students to highlight which red flag they think is present and explain why they have chosen that option(s).

If you would like to see what the answers are then please reach out to us at computerscience@bt.com and we will send them back to you.

Tuesday 12th March

Networks: 5G

Introduction
Imagine a world where every digital connection is super-fast, and you can chat with your friends, share videos, and play online games in the blink of an eye. That's the magic of 5G!

It's the fifth generation of mobile networks, and there are some big improvements over the previous versions, 3G and 4G. Do you know how your phone connects to the internet when you're not on Wi-Fi? 5G makes that connection faster, more reliable and with less delay than ever before. It's like upgrading from an ordinary car to a Formula 1 car!

With 5G, you can download your favourite games, stream 4K videos, and video chat with friends seamlessly, all at the same time, without those annoying delays where the buffer wheel spins endlessly. 5G therefore opens up new possibilities for innovation and technology.

But to do all of those cool things that use 5G, there is a network behind the scenes that allows it to happen.

A network is like a giant web that connects all of our devices (phones, computers, tablets, you name it!).

Have you ever physically posted a letter? Well, the 5G network (or any telecommunications network) is like a digital version of what happens with the post. The letters are like the data you're sending/receiving. The post boxes are like the routers that you have in your home or school and the people who deliver the post are instead replaced by clever algorithms that route the packets of data over cables (ever heard of fibre-optic cables?). So as much as these networks may appear invisible, there is lots of physical kit needed to enable it all.

With faster speeds and lower latency (the time it takes for information to travel from point A to point B), 5G networks create a more responsive and connected world. It's not just about making our videos load faster; it's about building a foundation for futuristic technologies like smart cities, self-driving cars, and the Internet of Things (IoT).

Get ready for the 5G revolution!

Activities
Activity One (Human Network) needs to be done in groups of 6.

The groups will act out the different types of network topology by connecting themselves to their classmates via pieces of string. The idea being that they spark up a conversation in their groups but can only communicate with the people they are connected to by the string.

The maximum number of pieces of string that a group will need is 15 – this is so that they can complete a fully meshed network (where all people in the group of 6 are connected to everybody else). The length of string isn't set for any other reason than it needs to be long enough so people can stand comfortably apart (hence we've recommended 1.5m).

They then have three business scenarios that they're challenged with and must select (and then play out) the network topology they think would best resolve the issue. Importantly here they must justify their answers with the advantages and disadvantages of them.

Activity Two (Packet Switching) is a whole class activity. It would be ideal if the classroom could be set up into multiple banks of tables for this one, with each bank of tables seating 4-6 students.

The classroom will become a computer network with everyone playing a role:

- The classroom will act as the Internet – one large network full of many smaller networks.
- Each bank of tables will be its own smaller network.
- The person with the Router Card will act as the Network Router.
- The people with the Switch Card will act as the Network Switch.
- Everyone with the Computer Cards will be acting as a computer.

There are templates to print out for this activity. They consist of role cards that will need to be handed to students, so they understand their role. Each person playing the role of a computer will also need three message cards (they will split their message across these 3 cards which resembles how networks break down data into packets).

Based on a bank of tables that seats 4 students:
- **Give every 3 out of 4 students a Computer Card (each of these students will also need three Message Cards)**
- **Give 1 of every 4 students a Switch Card.**

- **Nominate a student in class to have the Router Card – they will need to sit separately from the banks of tables (alternatively, you as the teacher can have the Router Card).**

- **Number each bank of tables, starting from 1.**

- **Ask the students with a Switch Card to sit down at separate banks of tables so that each bank only has one person with a Switch Card.**
- **Ask the rest of the students, who have a Computer Card to fill the rest of the seats.**

The students who are acting as computers will send messages across the classroom via their message cards. However, they can't just write their message cards and go and hand them to the recipient. They must hand their message cards to the person acting as the network switch on their bank of tables. Only this person can leave the table and will hand all the message cards from their table to the router. This person will look at the destination address on each message card they are given and take that message card to the 'network switch' on the bank of tables it is intended for. At this end the person playing the network switch will distribute the message cards to the recipient on their table.

This is to simulate how a message is sent across a computer network.
There is no end point to this activity, it can go on for as long or short as you like. However, as the students won't know who they're sending their message to initially (as they won't know the 'IP address' of their friends for example), it may mean some students randomly receive more messages than others with the potential for some not to receive a message at all. So you may wish to play until everyone has received a message to feel included.

Activity Three (Network Latency Relay) is designed to show the difference in latency (delay) in the 3G, 4G and 5G mobile networks.

This activity will require 15 people per 'go': 5 students per mobile network (3G, 4G & 5G). In a class of 30, you can run this activity twice or run the two groups of 15 simultaneously if you have the space. The 5 roles per zone are:

- Sender
- Receiver
- Network Node
- Instructor
- Timer

This will require 5-10m worth of space for each mobile network zone, as you're going to be marking out a course/track for all three. Depending on how much room you have, you may need to run 3G, then setup the 4G track, then 5G. If you have the available space, you can run them all at the same time for greatest effect.

For each zone, you will need a start and finish line (~10m from one another) – also mark out the mid-point between the two.

- 3G area: from the halfway marker to the finish line, create a windy path using cones or markers (wide enough for someone to walk between).
- 4G area: from the halfway marker to the finish line, create a straight path using cones or markers (wide enough for someone to walk between).
- 5G area: nothing needs doing to this space.

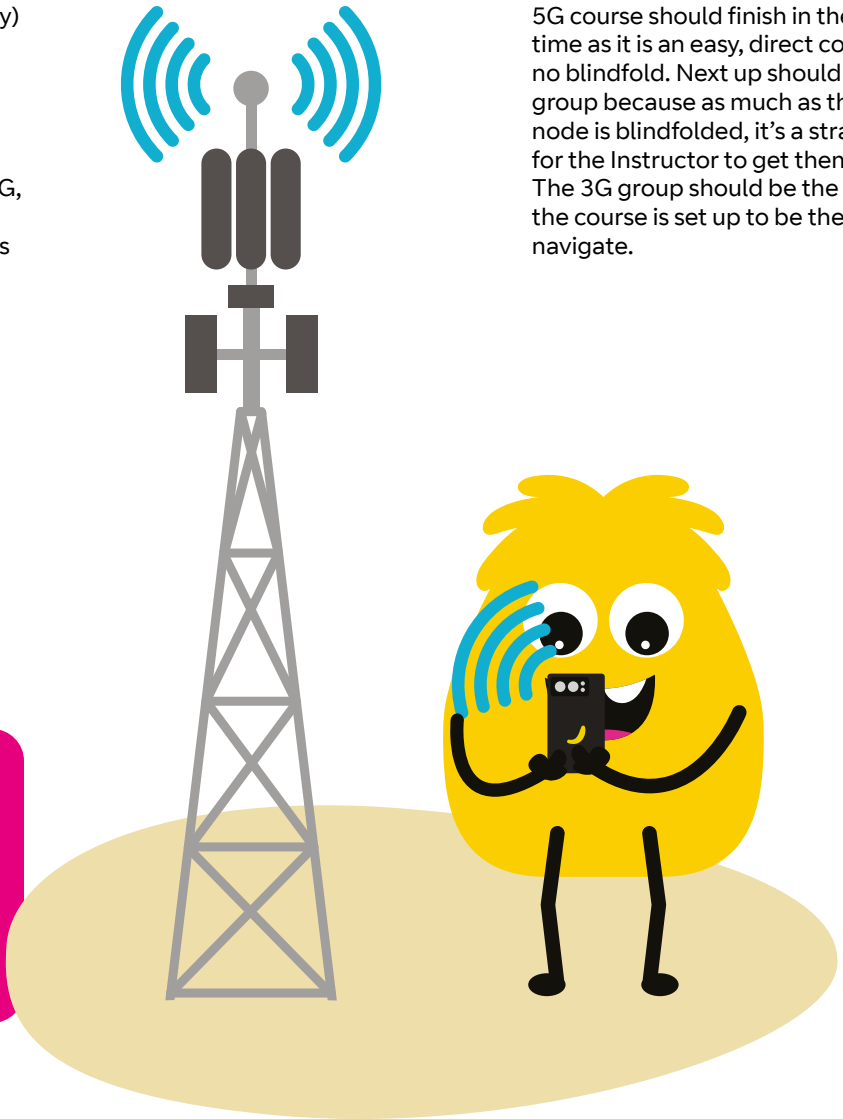
If you want to further emphasise the impact of latency, you could add some obstacles to navigate along the path for 3G and 4G; ensuring that the obstacles for 3G are more difficult to work around than the 4G area, and that nothing is blocking the path for the 5G course.

You will need to decide on an object which will represent the data that needs to be sent over the network. This is what will be passed between Sender, Network Node and Receiver. It can be anything, from a pencil to a carboard box.

- The Sender needs to stand on the Start Line, holding the object. The object represents data that needs to be sent over the network.
- The Receiver should stand on the Finish Line.
- The Network Node should be positioned on the marker indicating the middle of the track (the Network Nodes for the 3G & 4G areas should also be blindfolded).
- The Timer should position themselves on the sidelines, somewhere they can see the Network Node.
- The Instructor should position themselves on the sidelines, in between the middle marker and the Finish Line.

The timer will have hold of the stopwatch and will hit go as soon as the Sender hands the object (data) over to the Network Node. They should stop it as soon as the object has been delivered to the Receiver.

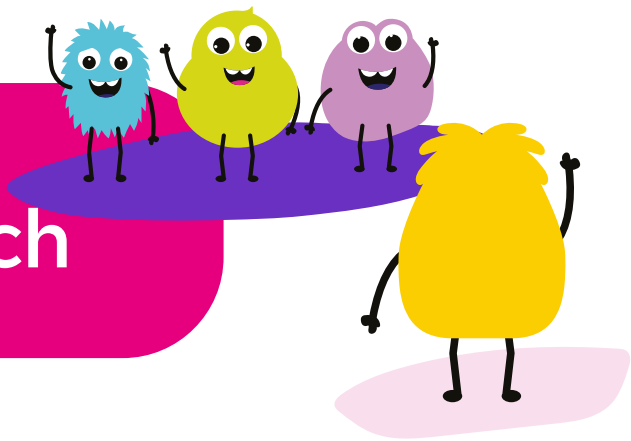
The instructor will then be verbally directing the Network Node on how to get to the Receiver. Those on the 5G course should finish in the fastest time as it is an easy, direct course with no blindfold. Next up should be the 4G group because as much as the network node is blindfolded, it's a straight route for the Instructor to get them to take. The 3G group should be the slowest as the course is set up to be the hardest to navigate.



We'd love to see pictures of you all getting involved with the activities. Email these to us at **computerscience@bt.com** telling us which school you're from.

Or post it on social media and mention @adastralpark with the hashtag #BSW24.

Wednesday 13th March



People: Diversity & Inclusion

Introduction

We're all different.
We all have our own unique stories.
But we all want to feel like we belong to a community.

Diversity is like a colourful painting, where each colour is represented by someone from a different race, culture, religion, ability level or gender. Individually lovely, but collectively they come together to create something even more special.

Embracing diversity means understanding that no two people are the same. It means appreciating the unique qualities, experiences, backgrounds, beliefs and perspectives that we all have. That's the beauty of diversity – it's about celebrating our differences, and it's what makes our classrooms and workplaces so brilliant. If we were all the same, the world would be a pretty boring place!

When it comes to a company like BT, our customers come from all over the world, with people from all races, cultures, religions, abilities, genders and viewpoints. We therefore need an equally diverse range of employees, otherwise our products and services won't meet the needs of our customers.

But what about inclusion?
Inclusion is like opening the doors wide and inviting everyone to your party. It's about making sure that everyone feels welcome, respected and valued, no matter who they are or where they come from. In an inclusive community, nobody feels left out.

By having an inclusive environment, be that in the classroom, workplace or at home, we make sure that everyone's voice is heard, and everyone's experiences are acknowledged. This encourages a sense of belonging amongst everyone who makes up that class, business, football team or any other form of community.

We all have a responsibility in building a culture of diversity and inclusion. We have the chance to learn from one another, share our unique stories, and create a supportive space where everyone feels they belong.

Let's celebrate our differences and build a world where everyone feels valued and included!

Activities

Activity One (Guess Who?) is a whole class activity and a spin-off from the popular board game.

The purpose of this activity is to get everyone to learn something new about their classmates. It may help to start new conversations or form new friendships but importantly it is designed to celebrate diversity and encourage inclusion.

Students need to think of an interesting fact about themselves that they believe other people may not know.
They should write this down on a piece of paper and put their name alongside it. If people ask for examples or ideas for their fact, you can suggest that it could be something like their favourite sport, a cool experience they've had, something about their family, a favourite holiday destination or the thing they'd most like to do in future.

As the teacher, collect these all in and choose one at random without showing the class. Get everyone to start by standing up or by putting their hands up.

Select two 'Guessers' who'll take it in turn to ask yes/no questions of the rest of their class to narrow it down and find out who the fact belongs to.

- If the question doesn't apply to their fact, students should sit back down again / lower their hand.
- The last one standing / with their hand up should be the individual the fact belongs to.
- If everyone left sits down / puts their hand down after a question is asked, you can start that round again and ask a different question (once those people who were left are reinstated).

This can be played again and again with new facts or to reveal facts about more of the people in the class.
Feel free to tweak the game to make it work better for you.

Activity Two (The People Project) is to be done in pairs and is more of a research activity.

The purpose of this activity is for students to learn lots of new, interesting information about everyone else in their class, helping to accept people for their similarities and differences. By doing this and keeping an open mind to everything they learn, it'll help to make the classroom a supportive space where everyone feels they belong; therefore, creating a more inclusive environment.

Activity 1 was a start, but this is about going into more depth about the person they are partnered up with. Ideally this would not be a usual pair, so that both students are able to learn more about someone they are not best friends with already.
Students should be given some time to talk and ask questions of one another to find out as much information as they can.

They should then write up their findings. These could take any form (e.g. written essay / PowerPoint slides / annotated drawings etc.). They should check that their partner is ok with what they have produced is accurate and appropriate for sharing. Once everyone is happy, students can present their reports back to the rest of the class.

We'd love to see pictures of you all getting involved with the activities. Email these to us at **computerscience@bt.com** telling us which school you're from.

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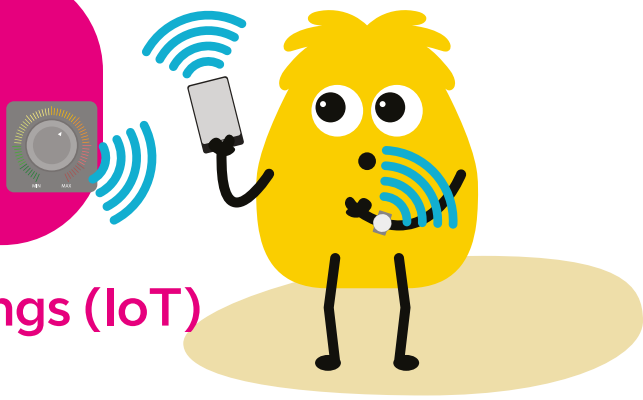
Thursday 14th March



Connected Devices: Internet of Things (IoT)

Introduction

Imagine a world where your everyday objects at home or school can talk to each other… making our lives easier, more connected, and a whole lot more exciting! Well, the Internet of Things, or IoT for short, is about connecting these objects to the internet to do just this.

Picture this… your fridge sending a message to your phone to let you know when you're running out of your favourite snack. Or your alarm clock not just waking you up, but also switching on the kettle or turning on the heating.

With our devices communicating and working together via IoT, our lives can become smarter, more convenient and even more efficient.

How does it work? Well, it's all about sensors, tiny computers and internet connections embedded in everyday objects or devices. These can then collect and share information, take commands, and work together to make our surroundings smarter and more responsive.

Whether it's your smart home devices or wearable tech, they all become part of this interconnected web, making your life more fun and efficient.

IoT could help to make the world a better place. Imagine a smart city where traffic lights change based on live traffic data, reducing queuing and pollution. Or think about farmers working on a smart farm using sensors to take better care of their crops and animals.

There are so many possibilities, so what item would you like to be 'smart' and part of the Internet of Things? How would it help you in your life at home or school?

Activities

Activity One (Taking the Temperature), **Activity Two** (Show Me the Light) and **Activity Three** (Count My Steps) all use a BBC micro:bit. We use the device as an IoT sensor to show how data can be collected and used.

However, if you don't have a set of physical micro:bits, don't fret! You can still complete these activities using the simulator on the free-to-use website (Microsoft MakeCode for micro:bit). It won't give you the full, real-life experience, but you can still code it and test your program.

BBC micro:bits can also be borrowed, free of charge, from your local computing hub: Physical Computing Kits - Teach Computing.

These three activities have been designed to be 'self-run' so students can pace themselves. It is important however, that they read all the instructions carefully as the activities build up throughout.

If you are new to Microsoft MakeCode for micro:bit, use this simple guide to learn what it is and how to use it: The MakeCode editor.

For **Activity Three** (Count My Steps) to be used for real, you will need a BBC micro:bit battery pack. For guidance on how to fit that to your micro:bit, follow the steps at this link: Powering the micro:bit. If you don't have these, you can still test your code on the MakeCode simulator online.

If you would like to see some example answers for these activities then please reach out to us at computerscience@bt.com and we will send them back to you. Remember with computing that there are always multiple ways of solving the problem, as long as the solution fits the requirements. Hence the answers we provide may be different to what you or your students have done.

Activity Four (DIY IoT) is a creative, solo exercise where imagination is key!

- There is a templated worksheet to print out for this activity which has boxes to fill in for all 3 steps:
  - Define the problem
  - Design it
  - Make it

The idea is for students to think about an IoT device that they could create to make their lives easier/better.

IoT devices collect data and are connected on a network so they can then respond and do something. Examples could include: something that automatically opens the curtains in the morning when it is bright enough outside / a device that sends an alert to your shopping list when you've run out of your favourite lunchtime snack. You could hold a competition for the most creative, sensible or more useful device!

They should think about the current problem and write it down before designing their new device and drawing it out. Make sure they include labels to describe what the various features are, what they do and why.

The final step is to make it. This is where collecting together some creative materials would be useful e.g. old carboard boxes, scissors, tape, glue, coloured paper, straws, or coloured Pens or Pencils.

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Friday 15th March

Artificial Intelligence (AI): ChatBSW

Introduction
Artificial Intelligence (AI) is a computer, or set of computer systems, that can perform tasks that would normally require a human's intelligence. These tasks include things like problem-solving, recognising patterns and learning from previous experiences.

One exciting aspect of AI is machine learning, where computers learn from data to improve their decision making over time. For example, you could teach a computer to recognise cats in photos by showing it lots of pictures of cats. As the computer looks at more data (pictures of cats), it becomes better at identifying cats more accurately.

A good comparison for AI is with us humans...

- Just like when we were really young, we were taught what things were by those who looked after us. With AI, this is similar, because we load 'training data' into the computer to tell it what a cat looks like for example.
- As we grow up we start to learn things for ourselves, from our mistakes or from what we read. With AI, this is where machine learning comes in. The computer starts to get better at a certain task by looking at more and more data related to that topic.

AI is an exciting, fast moving subject area that has the potential to transform the way we live, work, or go to school. But what are the possible consequences of creating machines that can think and learn? How do we ensure that AI is used for the benefit of us humans only?

Activities
Activity One (Intelligent Piece of Paper) is a classroom activity of Noughts and Crosses which requires two students per go. It can be played repeatedly so that everyone gets a turn.
There is a template to print off which lists an algorithm; a set of instructions that need to be performed in a specified order to play the game. This is known as the Intelligence Piece of Paper (a.k.a. the AI).

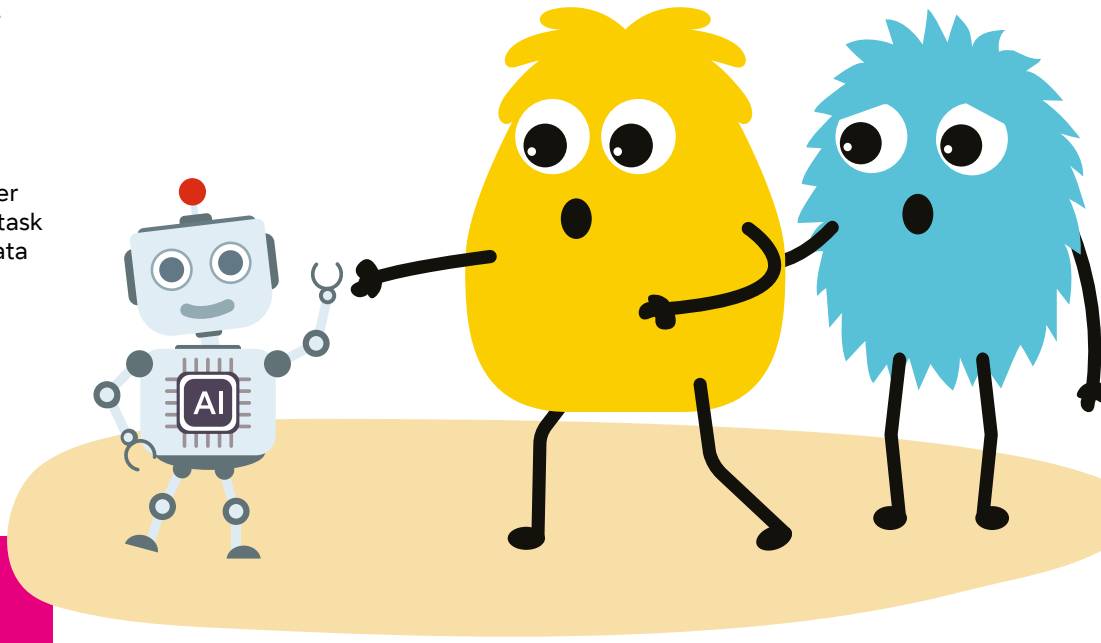
One person will play and represent the AI (the Intelligent Piece of Paper). The other person will play to try and defeat it.

You will need to draw a large 3x3 grid on the whiteboard/blackboard/screen for the game to be played.

The AI always goes first and the person playing on the side of the AI must read out loud the instruction and then follow the algorithm to the letter. The person trying to beat it can go wherever they like in response.

The Intelligence Piece of Paper may draw the game or win it but will never lose.

At the end of this activity, it is a good chance to bring up the discussion point of what makes AI intelligent? Is the Intelligent Piece of Paper actually intelligent?



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Monday 11th March

Security: Social Engineering

Activity 1

- Computer with internet connection
- Paper
- Pens or Pencils

Activity 2

- Print out Templates on Pages 8-13
- Scissors

Activity 3

- Print out Template on Page 14
- Pens or Pencils

Activity 4

- Computer with internet connection

Activity 5

- Print out Template on Page 15
- Pens or Pencils

Tuesday 12th March

Networks: 5G

Activity 1

- Scissors
- String (Cut roughly into 1.5m lengths)
- Paper
- Pens or Pencils

Activity 2

- Classroom with tables and chairs
- Pens or Pencils
- Print out templates on Pages 9 -12
  - ↘ Router Card (1 per classroom)
  - ↘ Switch Cards (based on a bank of tables that seats 4 students: give this to 1 of every 4 students)
  - ↘ Computer Cards (based on a bank of tables that seats 4 students: give this to every 3 out of 4 students)
  - ↘ Message Cards (3 per student)

Activity 3

- Stopwatch or timer
- Cones or markers to create a path
- Tape or marker to make a start and finish line as well as a middle marker
- Something to use as a blindfold
- Any object to act as the data being sent
- Pens or Pencils
- Paper

Wednesday 13th March

People: Diversity and Inclusion

Activity 1

- Paper
- Pens or Pencils

Activity 2

- Paper or a Computer
- Coloured Pens or Pencils (if using paper)

Thursday 14th March

Connected Devices: Internet of Things (IoT)

Activity 1

- Computer with internet connectivity
- BBC micro:bit v2*
- USB to micro USB cable

Activity 2

- Computer with internet connectivity
- BBC micro:bit v2*
- USB to micro USB cable

Activity 3

- Computer with internet connectivity
- BBC micro:bit v2*
- USB to micro USB cable
- BBC micro:bit battery pack

Activity 4

- Print out Template on Page 7
- Pens or Pencils
- Colouring Pens or Pencils
- Materials that can be used to make a physical model of the IoT device e.g.
  - ↘ Scissors
  - ↘ Glue
  - ↘ Sellotape
  - ↘ Cardboard
  - ↘ String
  - ↘ Straws

Friday 15th March

Artificial Intelligence (AI): ChatBSW

Activity 1

- Whiteboard (or any large surface to draw a 3x3 grid on)
- Whiteboard Pen (or anything to write with on chosen surface)
- Print out the Intelligent Piece of Paper on Page 4

**If you don't have a physical micro:bit, then don't worry, you can still complete these activities using the simulator on the free website https://makecode.microbit.org. It won't give you the full, real-life experience, but you can still code it and test your program!*

Templates & Worksheets

Where applicable, here are the various templates that you can print out in advance of British Science Week 2024, which goes live on Monday 11th March.

There are resources that need to be printed for the following activities across the 5 days (the page numbers below refer to the individual activity pack numbering):

Monday - Security: Social Engineering

- Activity 2 (Know Your Risks) – Templates on Pages 8-13
- Activity 3 (Profile Check-Up) – Template on Page 14
- Activity 5 (Scam Detective) – Template on Page 15

Tuesday - Networks: 5G

- Activity 2 (Packet Switching) – Templates on Pages 9-12

Thursday - Connected Devices: Internet of Things (IoT)

- Activity 4 (DIY IoT) – Template on Page 7

Friday - Artificial Intelligence (AI): ChatBSW

- Activity 1 (Intelligent Piece of Paper) - Template on Page 4

Answers

The following activities have answers that we can share with you on request:

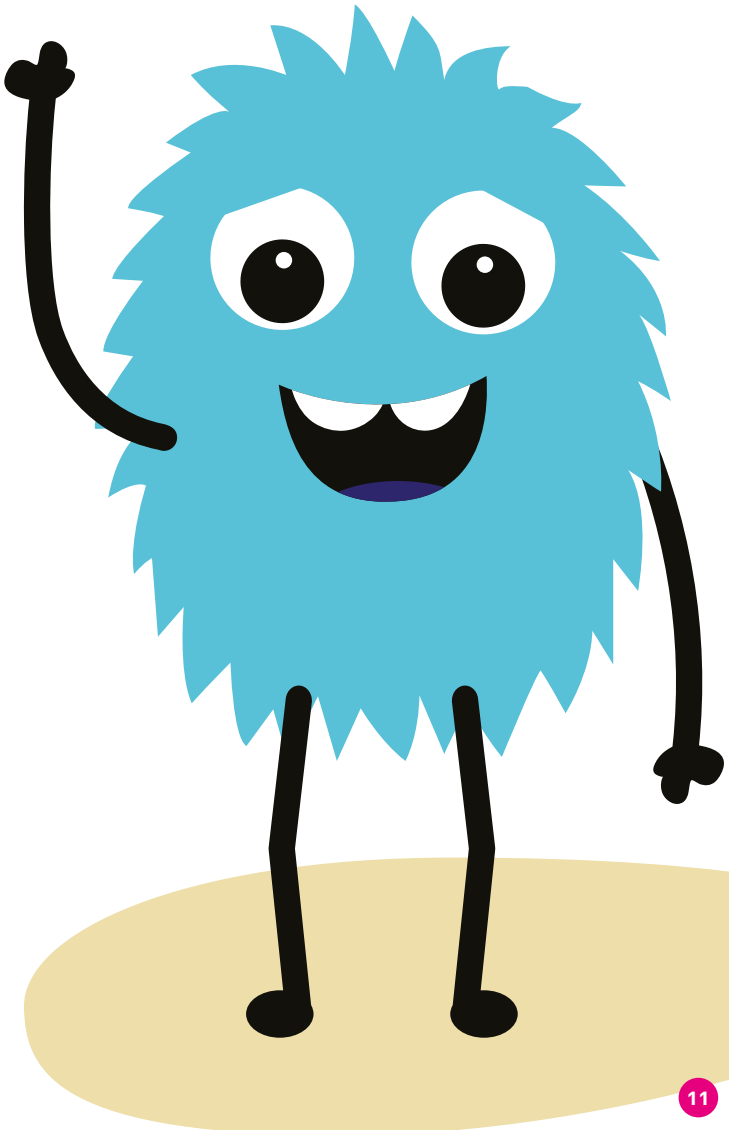
Monday - Security: Social Engineering

- Activity 1 (Cyber Live)
- Activity 3 (Profile Check-Up)
- Activity 5 (Scam Detective)

Thursday - Connected Devices: Internet of Things (IoT)

-
- Activity 1 (Taking the Temperature)
- Activity 2 (Show Me the Light)
- Activity 3 (Count My Steps)

If you would like a copy of the answers, then please reach out to us at computerscience@bt.com and we will send them over to you – good luck and enjoy!



Live Q&A Panel

On Friday 15th March we'll be holding a live Q&A session hosted by Carol (BT), between 1:30-2:30pm, with some of the subject experts who feature in our topics across the five days.

This will be a brilliant opportunity for you and/or your students to ask the following experts your burning questions! The Q&A webinar will be hosted on Zoom - click here to head over to the registration form.

Security: Social Engineering

- Mike - BT

Networks: 5G

- Cerys - BT

People: Diversity & Inclusion

- Claire – BT
- Marisela – Centre for SocioDigital Futures

Connected Devices : Internet of Things (IoT)

- Hannah – University of Suffolk

Artificial Intelligence (AI): ChatBSW

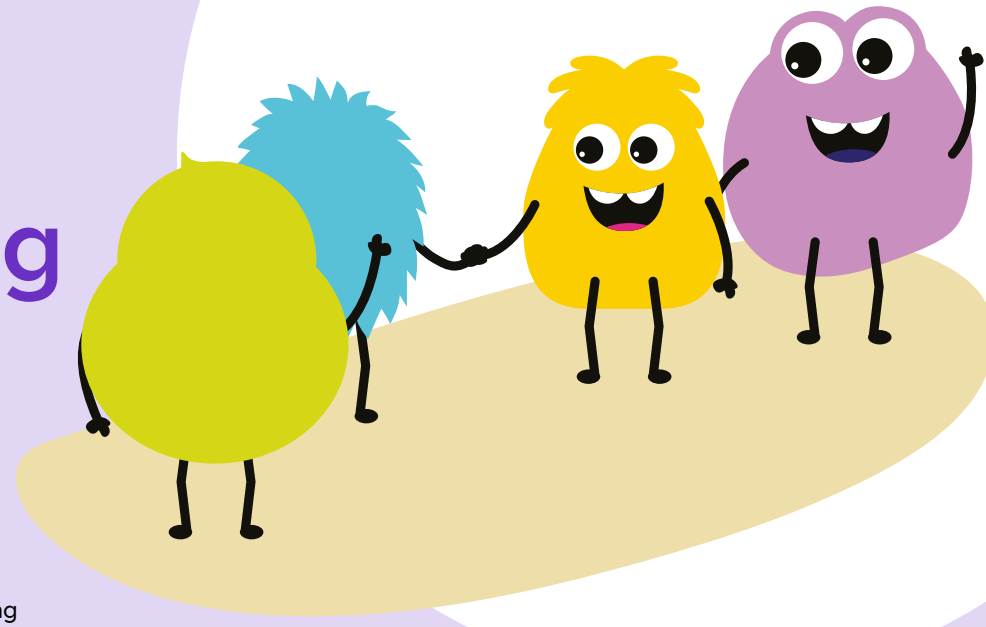
- Rob - BT

British Science Week

Social Engineering

activity pack

Social Engineering



Social engineering is a fascinating subject that delves into human psychology, focusing on our behaviours when interacting with one another. Imagine being able to influence people's thoughts, behaviours, or decisions without them realising – that's the essence of social engineering.

While it might sound like something out of a spy movie, social engineering is very real. It is a technique employed by criminals to manipulate others for various purposes.

Today's content for British Science Week has focused on data security. Social engineering from this perspective is the art of criminals targeting our human psychology. More specifically exploiting the trust we place in other people that makes us feel safe enough to share our personal information with them. Alternatively, it can be capitalising on our natural human tendencies, such as the desire to help or the fear of missing out.

Acquiring information like this allows the scammers to illegally gain access to personal information, computer systems, or get at our confidential data like passwords or bank details.
It doesn't involve hacking into computers or using complex algorithms; instead, it relies on understanding how people think and react in certain situations. This makes it particularly dangerous in our digitally connected world, where personal information is freely shared online.

Learning about social engineering not only increases your knowledge about cybersecurity and cybercrime, but it also enables you to be better prepared to tackle every day social interactions you have online and face-to-face.

Be wary out there, not everyone is as trustworthy as they may seem!

Teacher Links

- A lesson plan for a safety and security module atadastral.co.uk/go/set01
- Do the right thing - Cyber/ Online Safety atadastral.co.uk/go/set02
- Introduction to cyber security lesson plans atadastral.co.uk/go/set03
- Let's Chatterbox - Cyber/ Online Safety atadastral.co.uk/go/set04
- CyberFirst Navigators - some interactive online security resources on how to stay secure online atadastral.co.uk/go/set05

We'd love to see pictures of you all getting involved with the activities. Email these to us at **computerscience@bt.com** telling us which school you're from.

Or post it on social media and mention @adastralpark with the hashtag #BSW24.

Find Out More

- Hello World – Download your free issue all about Cybersecurity atadastral.co.uk/go/sef01
- Katie and Tex explore cyber security atadastral.co.uk/go/sef02

Have A Go

- Learn how to create and use an encryption technique known as the one-time pad atadastral.co.uk/go/seh01
- Code your own random username generator atadastral.co.uk/go/seh02
- Code your own random password generator atadastral.co.uk/go/seh03

Cyber Live

Grok Academy have some brilliant online resources for both physical and cyber security including activities, videos, and games.

But for this activity they have shared their Cyber Live exercise with you all...

There's been a major incident that needs your help! Here's what has happened so far:

A Navy Captain is held captive inside their ship at Sydney harbour. A major landmark has gone dark. And weapons are pointed at Sydney's busiest sites. It's all connected, and it's up to you to free the captain, track down the culprit, and stop them.

Kit List

- **Computer with internet connection**
- **Paper**
- **Pens or Pencils**

Instructions

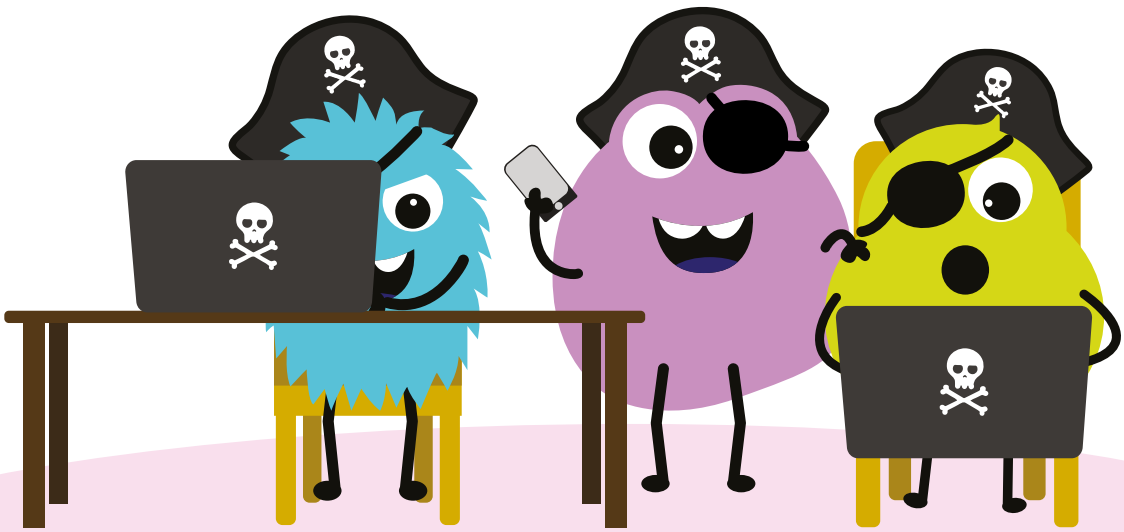
1 You will need to trace clues, solve puzzles, and figure out how to stop a large scale simulated cyber-attack before it's too late.

Can you stop the cyber-attack in time?

You'll need a computer to do it, and you may want some paper and a pen to make notes. But good luck and click this link to take you there.

So that you can explore some of their other excellent online resources, Grok Academy have kindly set up a link especially for British Science Week to take you there.

Visit it here: **grok.ac/BSW**



Know Your Risks

What information is safe to share online? This activity will help you understand the risks. The first step in understanding cyber security is knowing how to keep you and your information safe from people that shouldn't have access to it.

The information that people can find out about you online is called your digital footprint. You can decide what you share, and what you keep private. You can also look after your friends and family by being careful about what you share about them.

Learn about whether to share, not share or be cautious with different pieces of your personal information when posting online.

Kit List

Print out Templates on Pages 8-13

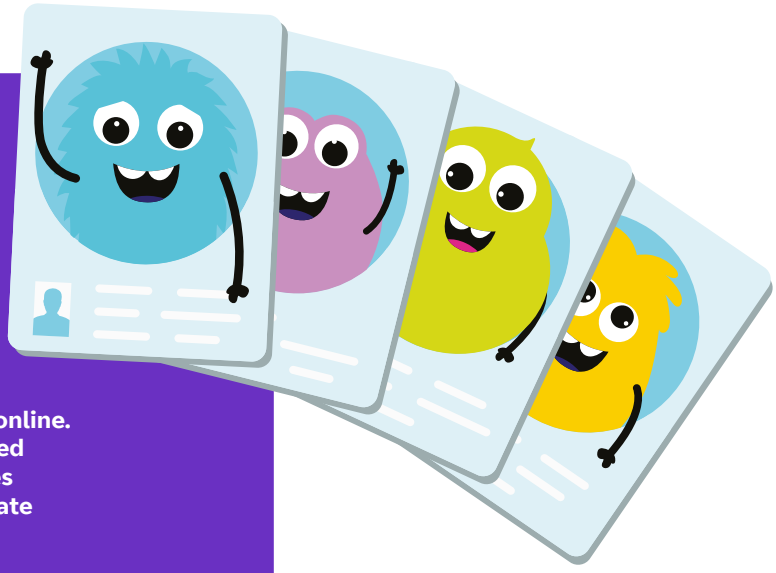
Scissors

Instructions

1. Print out the Templates on pages 8-13.
2. Cut out all of the cards – you should have 25 in total (they are double-sided).
3. Stack them in a pile, picture-side facing up, and shuffle the deck.
4. One person should draw a card and read what it says on the picture-side out loud.
5. In your pairs/group, you should discuss whether you think it is ok to share this personal piece of information online or not.
6. Organise the deck of cards into 3 piles:
   - OK to share
   - Share with caution
   - Don't share
7. Once you've sorted them all, go through each card one-by-one, turning them over to reveal what the answer is. It will also explain why you are ok to share it or why you shouldn't share this information.
8. Have a discussion in your class about whether you agree or disagree with these and explain why.

   Can you think of any examples you've seen of people sharing information online that you now think should have been kept private?

Profile Check-Up



We share lots of information about ourselves online. Some of this information is private, and we need to be careful who it is shared with. Small pieces of information can be combined to reveal private information.

Here's a quickfire activity to test what you've learned from the previous activity.

Kit List

Print out Template on Page 14

Pens or Pencils

Instructions

1. Print out the Template on page 14.
2. Take a look at Belinda Brooks' profile. It's from their social media app called Fistbump.
3. Using your pen or pencil, circle 5 pieces of personal information that Belinda has shared that you think shouldn't be posted online.

Activity 4

The Phisherman & Staying Safe Online

It's important that we all take both physical and cyber security very seriously.

To be better prepared, it's always good to know the potential ways in which people may try to attack you.

Therefore, we should all be doing some level of security training. Here are some you can try...

Work your way through the different questions, exercises, tips and tricks to make sure you're ready to tackle the digital world and keep your personal data secure!

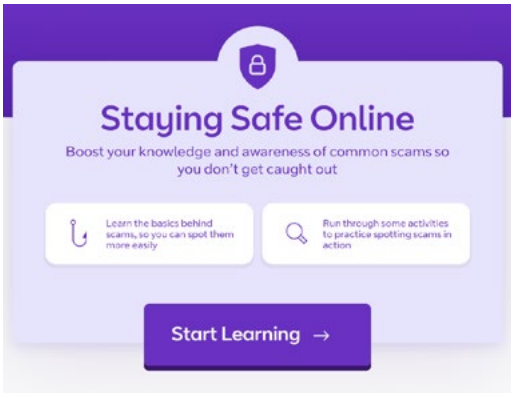
Kit List

Computer with internet connection

Instructions

1 For ages 7-11, click here to visit the Phisherman.

2 For ages 12+, click here to try Staying Safe Online.



Activity 5

Scam Detective

This quickfire activity aims to help you spot common features in scams and phishing messages, and test what you've learned from the previous activity.

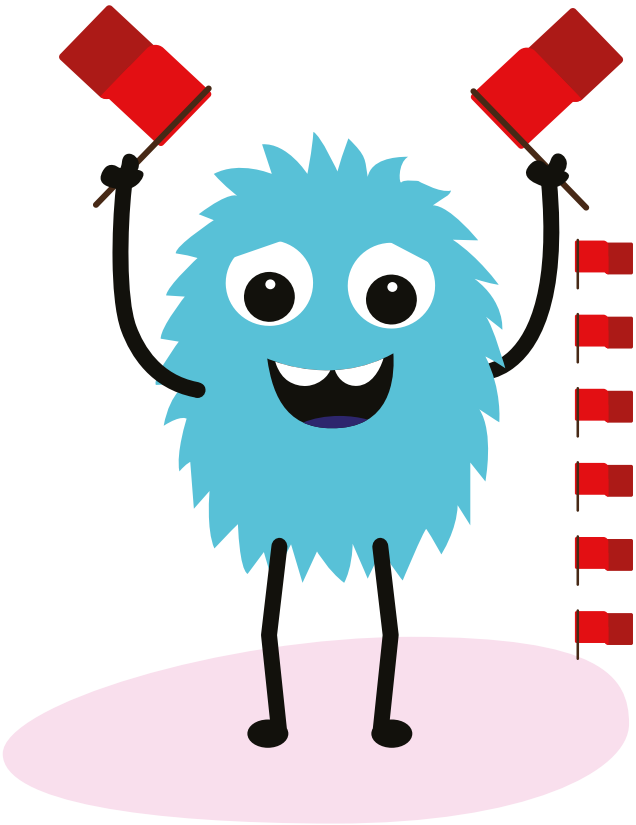
Kit List

Print out Template on Page 15

Pens or Pencils

Instructions

1. Print out the Template on page 15.
2. Using your pen or pencil, circle all of the red flags you can see, and make a note of them below each image. Be sure to explain why you think what you've circled is a red flag.



The red flags are:

- If you're put **under pressure** to answer quickly and act fast
- If what they're offering is **too good to be true**
- If it's an **unsolicited message** (you didn't ask for it)
- It's from an **untrusted source**
- There's **dodgy design**
- It's a **strange request** from someone you know or a well-known business

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Digital technologies and computing resources for your classroom.

Sign up your students at:
grok.ac/cyber

grok academy | Schools Cyber Security Challenges

Teaching cyber security?

- FREE interactive classroom activities
- Aligned to the Digital Technologies curriculum
- Professional development for teachers
- Intelligent automatic feedback

Sign up your students at:
grok.ac/cyber

Your Name

Left- or Right-Handedness

Hair Colour

Your Nickname

The Weather

Your Town or City

Hobbies & Sports

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Schools Cyber Security Challenges

Your name doesn't identify you unless it's completely unique. If you're not sure, consider using a nickname.

OK to share

Schools Cyber Security Challenges are brought to you by

ANZ aws

Australian Government
Australian Signals Directorate

Australian Government
Department of Industry, Science, Energy and Resources

BT Commonwealth Bank

FIFTHDOMAIN
SECURING CYBER SKILLS

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- Online coding competitions and challenges for students in years 3-12
- Workshops and online courses for teachers
- Expert email and online advice and support for teachers

grok.ac/cyber

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Schools Cyber Security Challenges

Your nickname doesn't identify you unless it's completely unique. Be careful to make sure it's not linked to your actual identity.

OK to share

grok academy

Schools Cyber Security Challenges

Your hair colour is safe to share. It might help you be identified if someone finds a school photo, but it's generally fine.

OK to share

grok academy

Schools Cyber Security Challenges

Your handedness might narrow you down to one person in ten, but it's probably not going to identify you.

OK to share

grok academy

Schools Cyber Security Challenges

Your sports and hobbies are great to share - it's a lot of what social media is for! But don't use them as part of any of your passwords, since they're easily found out.

OK to share

grok academy

Schools Cyber Security Challenges

Your town might help to separate you from people with the same name, but it's unlikely to locate you. Be aware that information can be combined though!

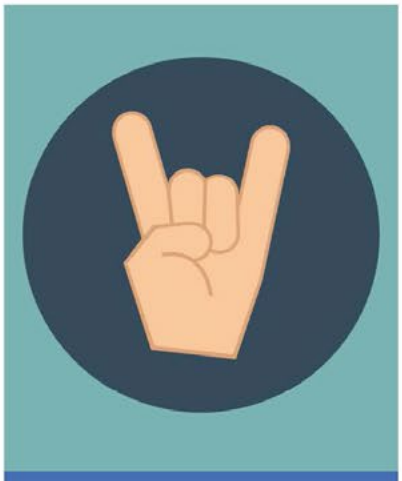
OK to share

grok academy

Schools Cyber Security Challenges

Go for it!
Share as much weather as you feel like!

OK to share



Favourite Band

GIFs

Memes

Banking PIN

Home Address

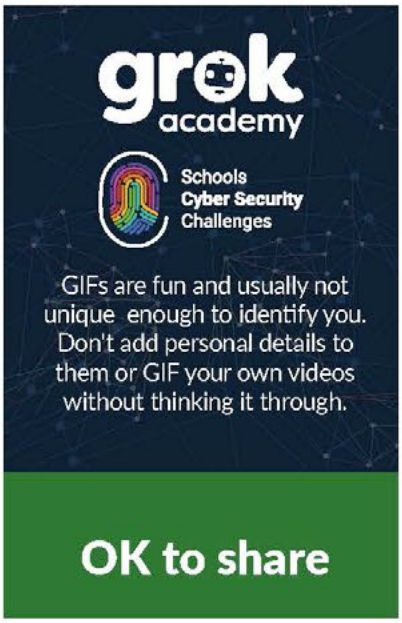
Pet's Name

New Drivers' License

Login & Password

Banking Details


grok academy
Schools Cyber Security Challenges
Memes are fun and usually not unique enough to identify you. Don't add personal details to them.
OK to share


grok academy
Schools Cyber Security Challenges
GIFs are fun and usually not unique enough to identify you. Don't add personal details to them or GIF your own videos without thinking it through.
OK to share


grok academy
Schools Cyber Security Challenges
Share your favourite band! They won't identify you and won't give away your location. Don't use them as part of a password as they are easily found out.
OK to share


grok academy
Schools Cyber Security Challenges
Your pet's name is not going to identify you, and won't give away your location. Don't use it as part of a password as it's often easy to find out!
OK to share


grok academy
Schools Cyber Security Challenges
Sharing your home address can allow people on the internet to find your physical location. This isn't a great idea so only share it with people you trust.
Don't share


grok academy
Schools Cyber Security Challenges
Don't share your PIN! There's no trick here, this would be a bad idea. If you do share it accidentally, make sure you change it immediately!
Don't share


grok academy
Schools Cyber Security Challenges
Giving away too much banking information can put your money at risk, and even your identity.
Don't share


grok academy
Schools Cyber Security Challenges
Don't share your login and password with anyone without a very good reason. Getting a friend to submit homework on your behalf is not a good reason.
Don't share


grok academy
Schools Cyber Security Challenges
A driver's license is a legal document that can be used as proof of ID. Your identity is at risk if you share a photo of it. Show people the photo in person!
Don't share

Geotagged Photos

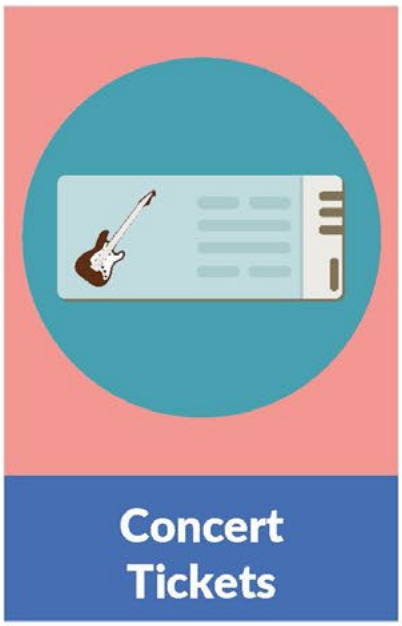
Birthday

Holiday Location

Email Address

Check-in Location

Mobile Number



Concert Tickets

Photos

School Name


grok academy
Schools Cyber Security Challenges
Holidays are great and worth boasting about but don't advertise the fact that your house is empty.
Share with caution


grok academy
Schools Cyber Security Challenges
Dates of birth can be used to identify you. Your birthday (without the year) is probably fine. Remember that information can be combined to make you identifiable.
Share with caution


grok academy
Schools Cyber Security Challenges
Geotagged photos can be used to identify you and locate you. It's like "checking in" somewhere; use caution or at least post later, when you are not at the location.
Share with caution


grok academy
Schools Cyber Security Challenges
Your mobile number can be used to send unsolicited messages, spam, or worse. Only share it with people you trust.
Share with caution


grok academy
Schools Cyber Security Challenges
Checking in somewhere allows people on the internet to find your physical location. This sort of thing should probably only be shared with those you trust.
Share with caution


grok academy
Schools Cyber Security Challenges
An email address may seem harmless to share, but it's often used as your login for websites. It's also really easy for software to find an email address for spam.
Share with caution


grok academy
Schools Cyber Security Challenges
Be careful as sharing the school you attend can help people from the internet find your location. Remember that information can be combined to make you identifiable.
Share with caution


grok academy
Schools Cyber Security Challenges
Photos can contain lots of clues about where you live, your physical location, and your likely movements. Be careful about what you choose to share.
Share with caution


grok academy
Schools Cyber Security Challenges
A concert ticket can be used to locate you, or if the barcode is shared, other people could print out a copy and go to the gig instead of you! Save the pics to share later.
Share with caution

Profile Check-Up Template

FISTBUMP PROFILE

fistbump

Find five things on Belinda's profile that she should consider changing.

24 September

6 Riverview St

Bay West

Riverside High

Status

Woo! Personal best on my regular 3 km run.
Feeling great right now!

Recent posts

Can't believe this is the view from the end of my street!!?! Good job parents!

12 fistbumps

Suggested to mum that I might clean my room later and ... 💥

32 fistbumps

I could finish doing this English homework, or I could go for a run 🏃🤔

9 fistbumps

Me: <runs out of phone battery>
Me later: OMG like everything happened on FB while I was gone!

21 fistbumps

Breakfast of champions! At least my team hopes so!

13 fistbumps

Where can you find me every Tuesday? @Allison meet me at the oval at 6?

6 fistbumps

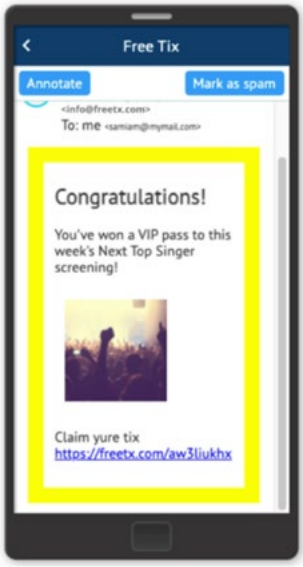
Doing Monday like a boss 💪😎

17 fistbumps

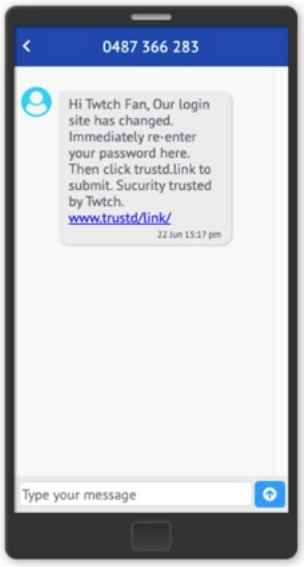
How good are 🦙 I mean seriously?

43 fistbumps

Scam Detective Template

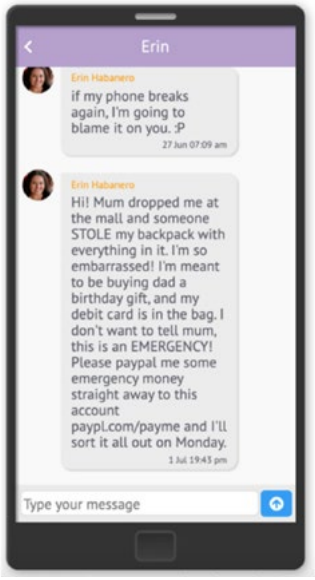


Red flags:



Red flags:

Red flags:



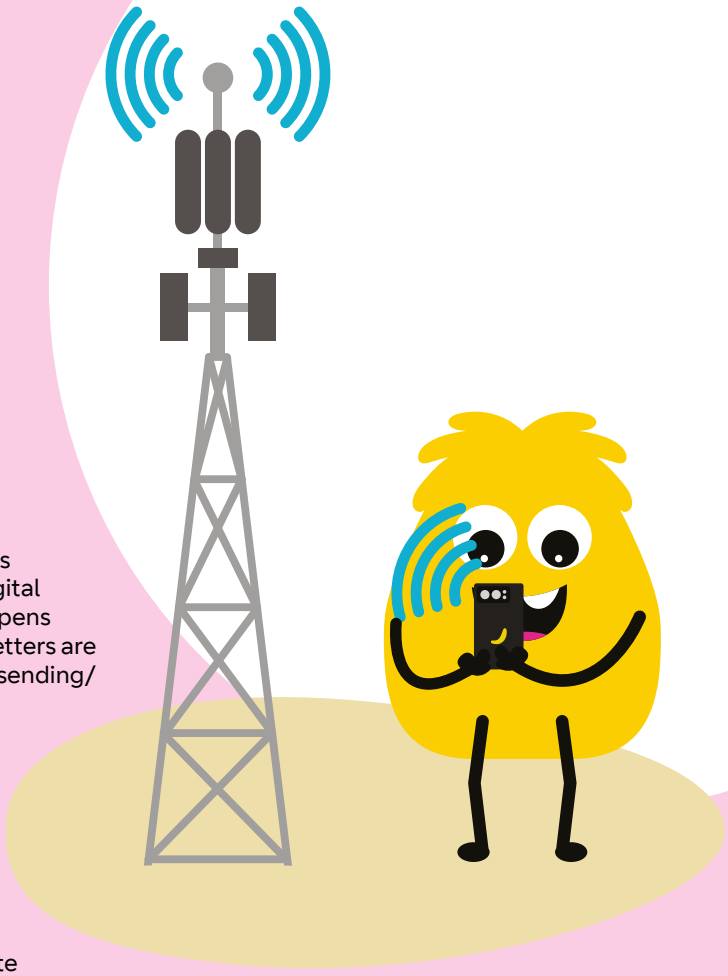
Red flags:

British Science Week

5G

activity pack

5G



Imagine a world where every digital connection is super-fast, and you can chat with your friends, share videos, and play online games in the blink of an eye. That's the magic of 5G!

It's the fifth generation of mobile networks, and there are some big improvements over the previous versions, 3G and 4G. Do you know how your phone connects to the internet when you're not on Wi-Fi? 5G makes that connection faster, more reliable and with less delay than ever before. It's like upgrading from an ordinary car to a Formula 1 car!

With 5G, you can download your favourite games, stream 4K videos, and video chat with friends seamlessly, all at the same time, without those annoying delays where the buffer wheel spins endlessly. 5G therefore opens up new possibilities for innovation and technology.

But to do all of those cool things that use 5G, there is a network behind the scenes that allows it to happen.

A network is like a giant web that connects all of our devices (phones, computers, tablets, you name it!).

Have you ever physically posted a letter? Well, the 5G network (or any telecommunications network) is like a digital version of what happens with the post. The letters are like the data you're sending/receiving. The post boxes are like the routers that you have in your home or school and the people who deliver the post are instead replaced by clever algorithms that route the packets of data over cables (ever heard of fibre-optic cables?). So as much as these networks may appear invisible, there is lots of physical kit needed to enable it all.

With faster speeds and lower latency (the time it takes for information to travel from point A to point B), 5G networks create a more responsive and connected world. It's not just about making our videos load faster; it's about building a foundation for futuristic technologies like smart cities, self-driving cars, and the Internet of Things (IoT).

Get ready for the 5G revolution!

We'd love to see pictures of you all getting involved with the activities. Email these to us at **computerscience@bt.com** telling us which school you're from. Or post it on social media and mention @adastralpark with the hashtag #BSW24.

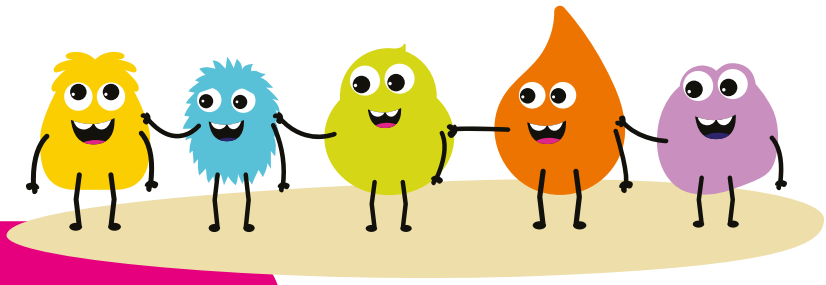
Teacher Links

- Network Hunt - Understand computer networks
  atadastral.co.uk/go/n5gt01
- Modelling the Internet - Understanding how the internet provides services such as the world wide web
  atadastral.co.uk/go/n5gt02

Find Out More

- Hello World – Download your free issue all about Systems & Networks
  atadastral.co.uk/go/n5gf01

Activity 1



Human Network

The first activity is going to focus on what a network is and what it's made up of.

In order for devices to communicate, they have to be connected to one another, either physically or wirelessly. In its simplest form, a network is made up of the end devices and the bit in the middle connecting them. Those devices could be smartphones, tablets, computers or Internet of Things (IoT) devices. The biggest example of a network is the Internet, which is made up of tonnes of smaller networks that allow all our devices to talk to one another.

Question: How many devices (also known as nodes) do you think make up the smallest form of network?

If you said 2 devices/nodes, then you would be correct!

This type of network is called 'point-to-point', where the device at one end of the network can only talk to the device at the other end of the network, and vice-versa.

Question: What potential problems or limitations can you think of with a point-to-point network?

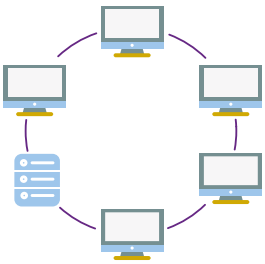
Well… here is one potential problem: what if that bit of cable in between your device and the other device you're communicating with gets damaged or becomes faulty? There's no back-up. That might be ok if your message can wait until it is fixed, but what if you needed to phone the emergency services or communicate a message urgently to somebody?

In terms of the limitations… what if you wanted to be able to message your Mum as well as your friend? That wouldn't be possible; you would need a different type of network. Thankfully, there are lots of different types of networks which we'll explore in this activity. They are also known as Network Topologies or the Network Architecture.

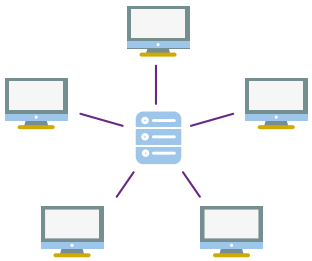
Here are six different types:

- Point-to-point

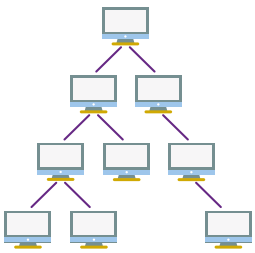
- Ring



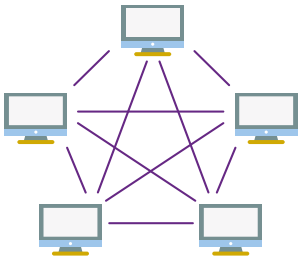
- Star



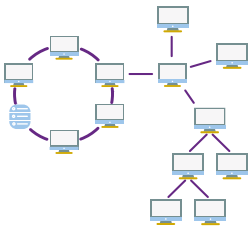
- Tree



- Mesh



- Hybrid



You're going to test out these network topologies using pieces of string, before selecting which network topology best fits some different requirements we'll challenge you with.

Rules:

- The string will connect you with somebody else meaning you can talk to them.
- If you aren't connected to one of your classmates by a piece of string, then you're not allowed to talk to them.
- Only two people can be connected by a single piece of string.
- One person can be connected to lots of people at once by having multiple pieces of string.

Kit List

- Scissors
- String (Cut roughly into 1.5m lengths)
- Paper
- Pens or Pencils

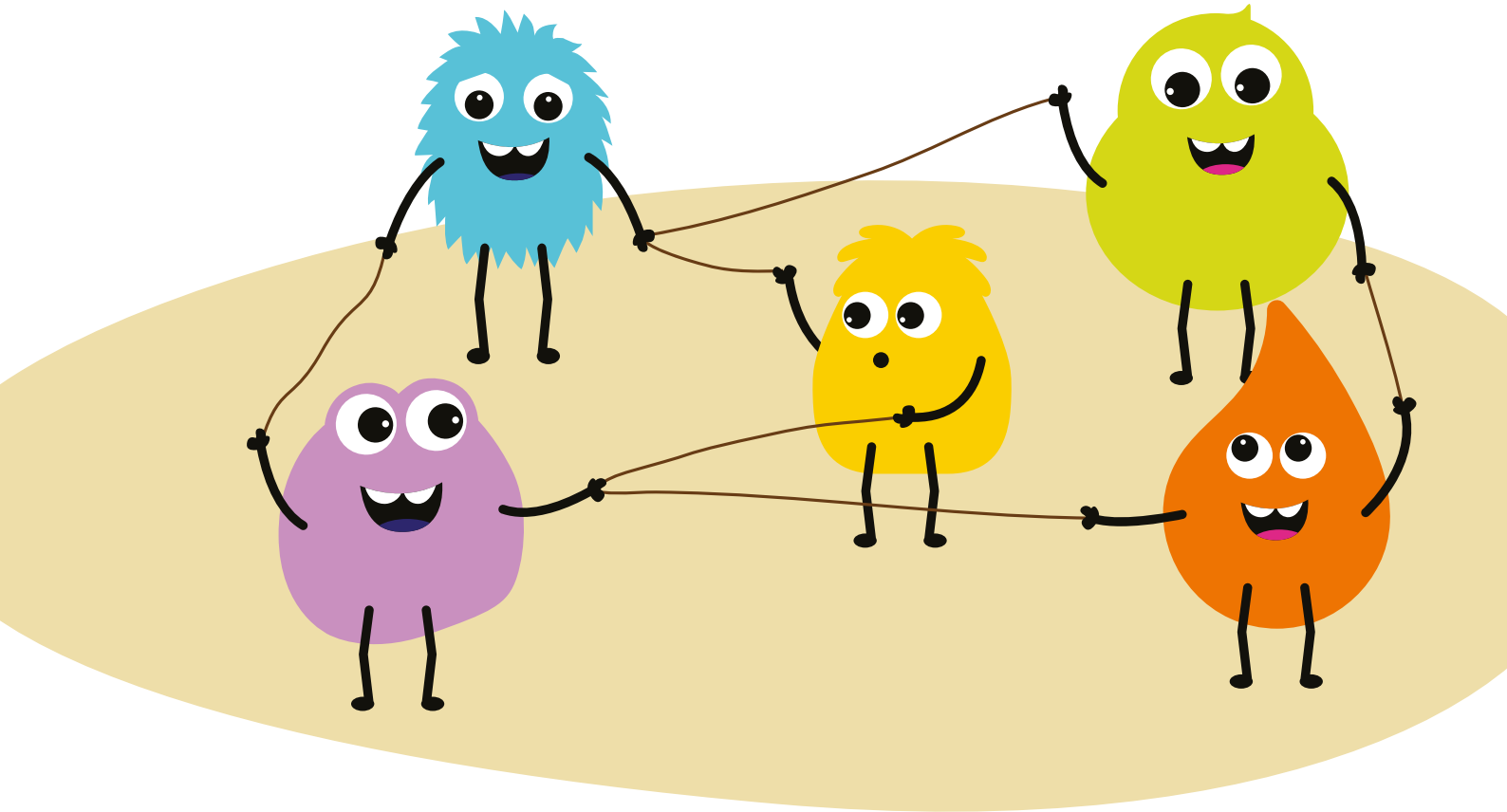
Instructions

1. Firstly, you'll need to get into groups of 6.
2. One person from your group should collect 15 pieces of string from your teacher.
3. With the string, make each of the following 5 network topologies using the people in your group. You should then start a conversation between you all, making sure that you follow the rules from page 3 in order to communicate with the other members of your group.
    a) Point-to-point
    b) Ring
    c) Star
    d) Tree
    e) Mesh
4. You're now going to be given three different business requirements.

    Your task is to select which network topology that you've learned about best solves the problem in your group's opinion.

    Be prepared to explain the strengths and weaknesses of the network architecture that you've chosen (feel free to draw your network out on some paper if it helps).

- **Challenge 1:** No expense spared; we need a network where everybody can speak to everyone else.
- **Challenge 2:** String is very expensive! Create a network that connects everybody but uses the smallest number of strings.
- **Challenge 3:** String can be cut. This means people get disconnected from the network. Make a network that keeps everyone connected even if one of the connections is broken.



Activity 2

Packet Switching

We're now going to look more closely at how messages get sent from one device to another within a network (regardless of the network topology). It uses something called Packet Switching.

To help us understand Packet Switching, we're going to compare it to sending a physical letter in the post.

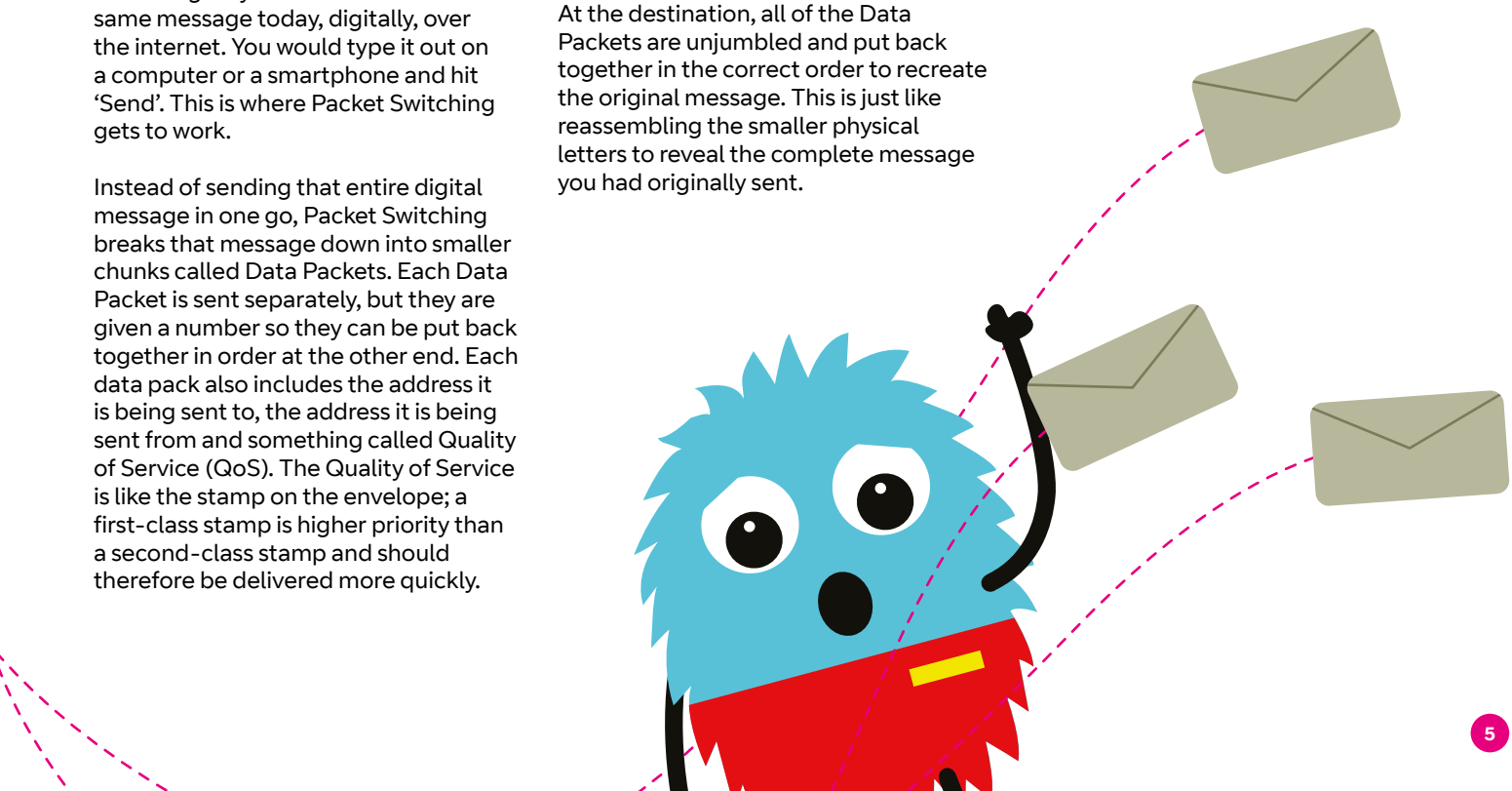
In the past, the only way to send a message to your friend who lives far away was to send them a letter. When you wrote your letter, you would put it in an envelope. On the front of the envelope you would write the address you want to send it to, and on the back of the envelope you would write your own address so that the letter could be returned if it got lost. You would then put a stamp on the front of the envelope and post it in a post-box. The information on this envelope helps the postal workers know where the letter is coming from, where it needs to go and how quickly it needs to get there.

Now imagine you wanted to send that same message today, digitally, over the internet. You would type it out on a computer or a smartphone and hit 'Send'. This is where Packet Switching gets to work.

Instead of sending that entire digital message in one go, Packet Switching breaks that message down into smaller chunks called Data Packets. Each Data Packet is sent separately, but they are given a number so they can be put back together in order at the other end. Each data pack also includes the address it is being sent to, the address it is being sent from and something called Quality of Service (QoS). The Quality of Service is like the stamp on the envelope; a first-class stamp is higher priority than a second-class stamp and should therefore be delivered more quickly.

These Data Packets don't all take the same route to reach your friend. Instead, they take different routes through the internet to reach their destination and may even arrive in the wrong order! Going back to your physical letter, imagine if that was split into lots of smaller letters, and each smaller letter could find its own way to your friend's house via different post offices and roads. That's what happens with Packet Switching.

At the destination, all of the Data Packets are unjumbled and put back together in the correct order to recreate the original message. This is just like reassembling the smaller physical letters to reveal the complete message you had originally sent.



Kit List

Classroom with tables and chairs

Pens or Pencils

Print out templates on Pages 9 -12

- ↘ **Router Card (1 per classroom)**
- ↘ **Switch Cards (based on a bank of tables that seats 4 students: give this to 1 of every 4 students)**
- ↘ **Computer Cards (based on a bank of tables that seats 4 students: give this to every 3 out of 4 students)**
- ↘ **Message Cards (3 per student)**

Questions to think about:

- Did you receive your messages in order every time?
- Did any messages get lost?
- What do you think the benefits of Packet Switching are?

Instructions

There are 5 key roles in this activity as shown below:

- The **classroom** will act as the Internet – one large network full of many smaller networks.
- Each bank of **tables** will be its own Local Area Network (LAN) - think of this like a home or school network.
- The person with the **Router Card** will act as the Network Router.
- Those with a **Switch Card** will act as the Network Switch for that block of tables.
- Everyone with the **Computer Cards** will be acting as a computer with their own unique IP Address.

1 Based on a bank of tables that seats 4:
- Print out the '**Computer Card Template**' from page 11, and hand them to every 3 out of 4 students.
- Print out the '**Message Card Template**' from page 12 three times for each student who has a Computer Card.
- Print out the '**Switch Card Template**' from page 10, and hand them to 1 of every 4 students.

↘ Nominate a student in class to have the **Router Card** – they will need to sit separately from the other banks of tables (or the teacher can have the **Router Card**).

2 Number each bank of tables, starting from 1.

↘ Ask the students with a **Switch Card** to sit down at separate banks of tables so that each bank only has one person with a **Switch Card**.

↘ Ask the rest of the students, who have a **Computer Card** to fill the rest of the seats.

3 Each **Computer** needs to write their unique IP Address on their **Computer Card** and in the '**From IP address**' field of all three of their **Message Cards**.
- The first number is the table number they are sitting at.
- The second number should be different for each **Computer** sitting at that bank of tables.

4 Each **Computer** now needs to think of a message or a question they want to send to someone else in the class. You will need to split your message up into three parts.
- Write the first part of your message in the '**Data**' field of your first **Message Card** and make sure you add that this is '**Packet Number**' 1 of 3.
- Repeat this step for the 2nd and 3rd parts of your message on the other **Message Cards**, making sure to change the '**Packet Number**' each time.
- You won't know who you're sending your message to as you won't know which IP address everyone has got. Therefore include your name in your 3-part message so the recipient knows who they've received their message from.

5 Each **Computer** needs to write the IP address of the person they want to send their message to in the '**To IP address**' field of each of their three **Message Cards**.

6 Once each **Computer** has finished filling in their three **Message Cards**, they should hand these to the **Network Switch** (person with the Switch Card) on their table.

It doesn't matter which order each **Computer** passes their **Message Cards** to the **Switch**, or whether the **Switch** jumbles them all up before delivering them to the **Router**.

7 The **Network Switch** should now look at the '**To IP address**' field of every **Message Card** they have been handed from the **Computers** on their bank of tables.

Is the first number of the '**To IP address**' the same as the table number they are already sitting on?
- If so, they should look at the second number of the '**To IP address**' and hand that **Message Card** to the relevant Computer on their table.
- If not, they should pass that **Message Card** to the **Router**.

8 The **Router** should now look at the '**To IP address**' field of every **Message Card** they have been handed from the **Switches**.

They should deliver each **Message Card** to the **Switch** on the relevant table number e.g. if the **Message Card** has '**To IP address**: 4.3', this should be delivered to the **Switch** on Table 4.

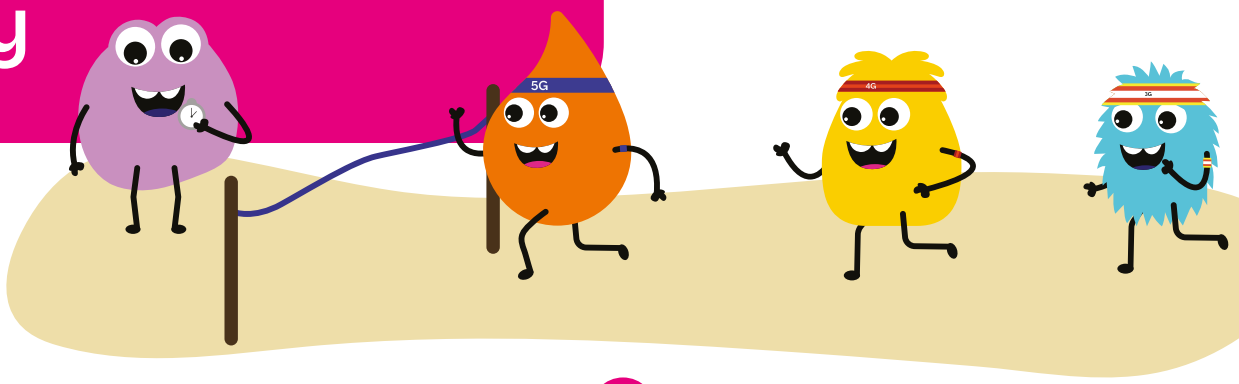
9 The **Network Switch** should now look at the '**To IP address**' field of every **Message Card** they have been handed from the **Router**. They should deliver each **Message Card** to the correct **Computer** on their bank of tables.

10 Once **Computers** have received three **Message Cards** from the same '**From IP address**', they should rearrange them into the correct order so they can read the message (**Data**).

11 **Computers** can choose whether to respond to their message / question and the activity can keep going on and on…

Activity 3

Network Latency Relay



Kit List

- Stopwatch or timer
- Cones or markers to create a path
- Tape or marker to make a start and finish line as well as a middle marker
- Something to use as a blindfold
- Any object to act as the data being sent
- Pens or Pencils
- Paper

From Activity 1, we learned about what a network is and how they can be set up in different topologies.

From Activity 2, we then looked at how a message is sent across these networks using packet switching.

For Activity 3, we are going to look at latency. This is the delay, or time, it takes for information to get from the sender to the receiver, the lower the better.

Latency is relevant to 'Networks: 5G', because one of the main benefits of wireless 5G connectivity is that it has very low latency. That's a really great thing because it means your messages send superfast!

But it's not only great for messaging your friends. If you are playing online games, latency (also known as ping time) can affect your ability to play. In gaming terms, latency refers to the delay between you pressing a button on a controller and the on-screen response in the game e.g., a character performing an action.

Low latency means faster response times and an overall improved gaming experience where you don't get the annoying buffer wheel! If you're gaming on a low latency network compared with the people you're playing with, you can potentially gain a competitive advantage!

This exercise is therefore going to demonstrate the impact of latency in networks, and compare the difference in latency between the 3G, 4G & 5G wireless mobile networks.

Instructions

1 Clear three patches of space (if possible, one next to the other) - like shown in the diagram on page 8.

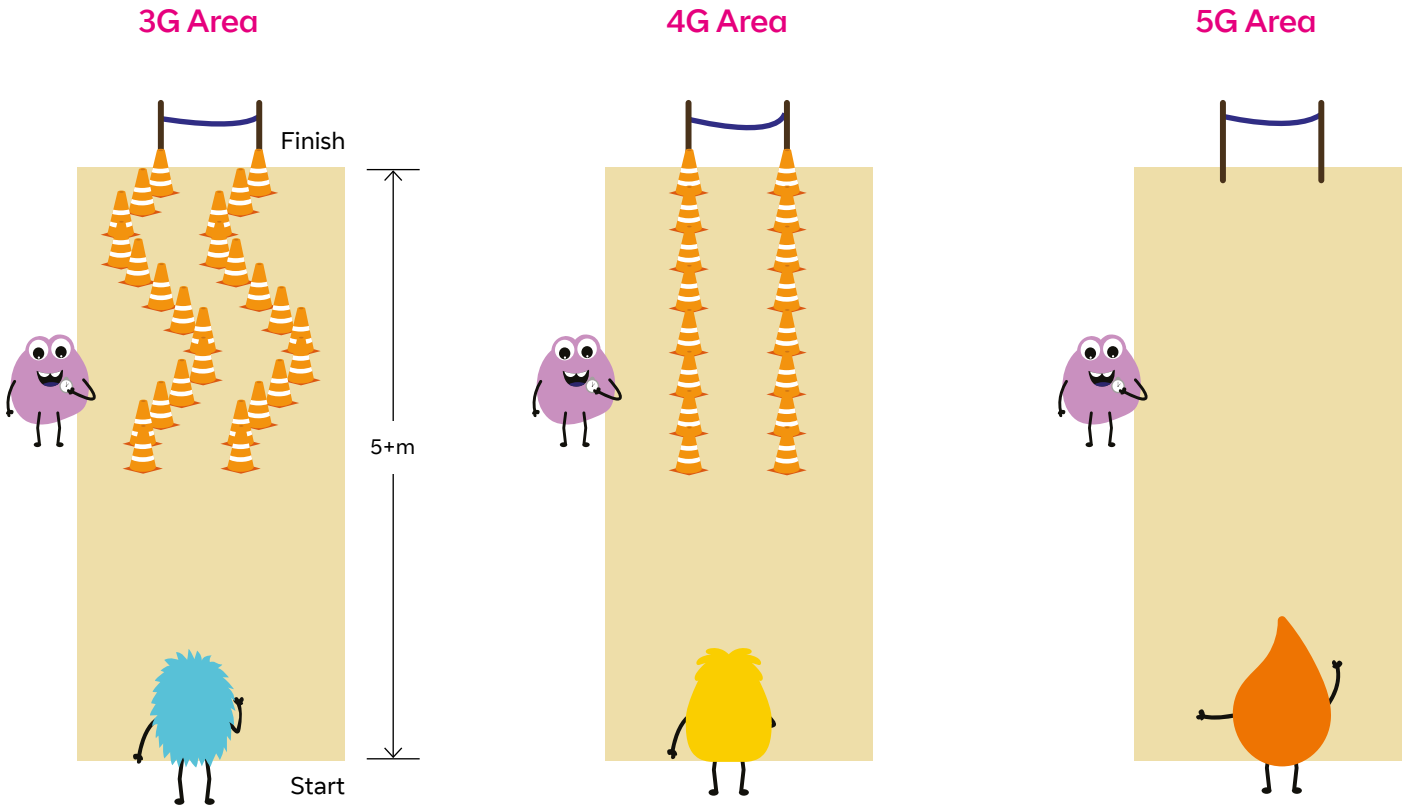
One area will represent 3G, one will represent 4G and the final area will be for 5G.

Mark a 'Start' and 'Finish' line at opposite ends of each of the three spaces you've cleared. Also mark the middle point of each course.

Ideally you will need around 5-10m of space between the start and finish lines for each area.

2
- **3G area:** from the halfway marker to the finish line, create a windy path using cones or markers (wide enough for someone to walk between).
- **4G area:** from the halfway marker to the finish line, create a straight path using cones or markers (wide enough for someone to walk between).
- **5G area:** nothing needs doing to this space.

If you want to further emphasise the impact of latency, you could add some obstacles to navigate along the path; ensuring that the obstacles for the 3G area are more difficult to work around than the 4G area, and that nothing is blocking the path for the 5G course.



3 Each area (3G, 4G & 5G) will require 5 people:
- **Sender**
- **Receiver**
- **Network Node**
- **Instructor**
- **Timer**

All three areas should kick off at the same time and run simultaneously. Therefore this activity may need to be run multiple times to allow for everyone to have a go.

4
- The **Sender** needs to stand on the Start Line, holding the object. The object represents data that needs to be sent over the network.
- The **Receiver** should stand on the Finish Line.
- The **Network Node** should be positioned on the marker indicating the middle of the track (the **Network Nodes** for the 3G & 4G areas should also be blindfolded).
- The **Timer** should position themselves on the sidelines, somewhere they can see the **Network Node**.
- The **Instructor** should position themselves on the sidelines, in between the middle marker and the Finish Line.

5 When the teacher says Go, the three **Senders** (one for each network), should walk their object in unison to the **Network Node**.

The **Timers** should start their stopwatches as soon as the **Senders** hand their objects (data) over to the **Network Nodes**.

6 Once the **Network Nodes** have hold of their objects, it is the job of the **Instructors** to provide instructions to the **Network Nodes** to guide them to the Finish Line (for the 5G area, this should be nice and easy as the **Network Node** can see where they need to go).

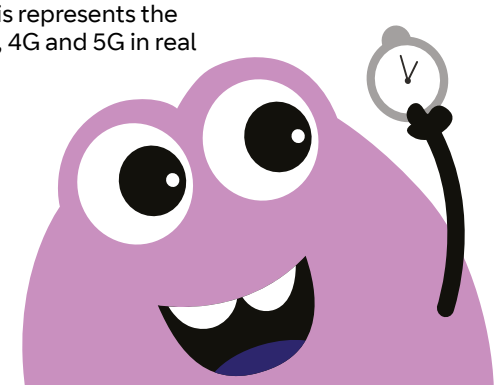
These must be spoken instructions. The **Instructor** must not physically guide the **Network Node** to the finish line.

7 The **Timers** should stop their stopwatch as soon as the **Network Node** hands their object (data) to the **Receiver**.

Each **Timer** should write their times down on a piece of paper.

Once all three areas are finished, the three groups should now compare their times. Which group took the longest to get their data from **Sender** to **Receiver**?

The time it takes for the object to travel from the **Sender** to the **Receiver** represents the latency in a network. What you should have found is that the 3G group took the longest, followed by the 4G group and that the 5G group was the fastest. This represents the different latencies for 3G, 4G and 5G in real life.



Packet Switching
Router Card Template

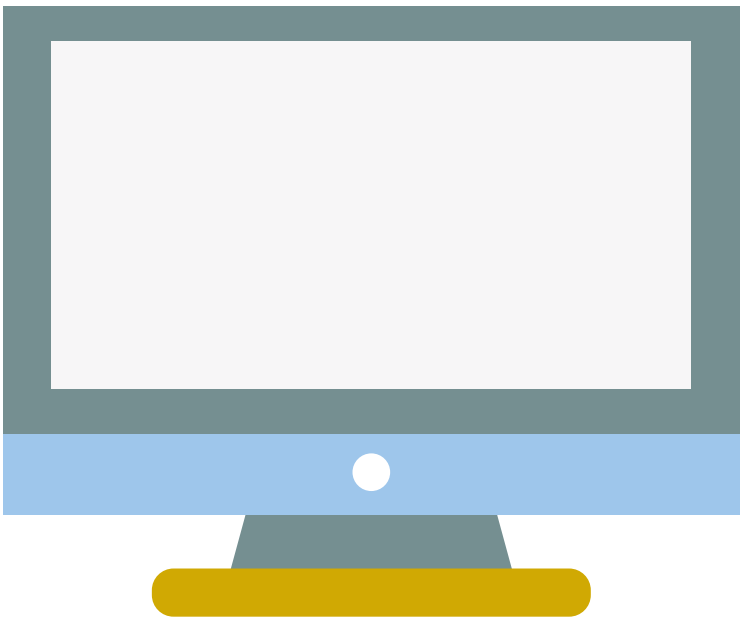
ROUTER

Packet Switching
Switch Card Template

SWITCH

Packet Switching
Computer Card Template

Computer



IP Address ____ . ____

Packet Switching
Message Card Template

To IP address: _____

Packet Number ___ of 3

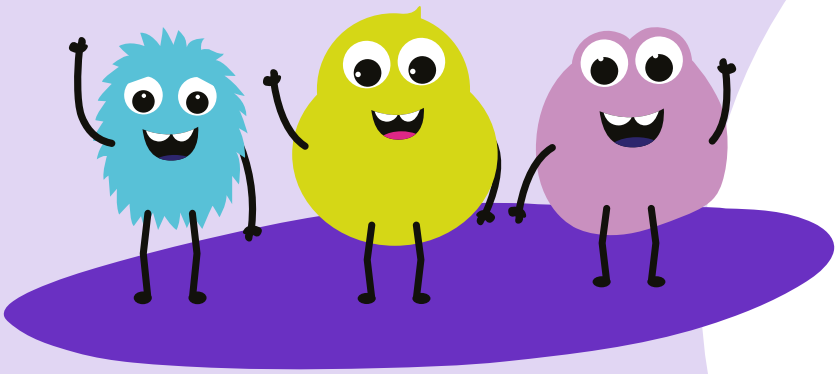
Data:

From IP address: _____

British Science Week

Diversity & Inclusion

activity pack



Diversity & Inclusion

We're all different. We all have our own unique stories. But we all want to feel like we belong to a community.

Diversity is like a colourful painting, where each colour is represented by someone from a different race, culture, religion, ability level or gender. Individually lovely, but collectively they come together to create something even more special.

Embracing diversity means understanding that no two people are the same. It means appreciating the unique qualities, experiences, backgrounds, beliefs and perspectives that we all have. That's the beauty of diversity – it's about celebrating our differences, and it's what makes our classrooms and workplaces so brilliant. If we were all the same, the world would be a pretty boring place!

When it comes to a company like BT, our customers come from all over the world, with people from all races, cultures, religions, abilities, genders and viewpoints. We therefore need an equally diverse range of employees, otherwise our products and services won't meet the needs of our customers.

But what about inclusion?
Inclusion is like opening the doors wide and inviting everyone to your party. It's about making sure that everyone feels welcome, respected and valued, no matter who they are or where they come from. In an inclusive community, nobody feels left out.

By having an inclusive environment, be that in the classroom, workplace or at home, we make sure that everyone's voice is heard, and everyone's experiences are acknowledged. This encourages a sense of belonging amongst everyone who makes up that class, business, football team or any other form of community.

We all have a responsibility in building a culture of diversity and inclusion. We have the chance to learn from one another, share our unique stories, and create a supportive space where everyone feels they belong.

Let's celebrate our differences and build a world where everyone feels valued and included!

We'd love to see pictures of you all getting involved with the activities. Email these to us at **computerscience@bt.com** telling us which school you're from. Or post it on social media and mention @adastralpark with the hashtag #BSW24.

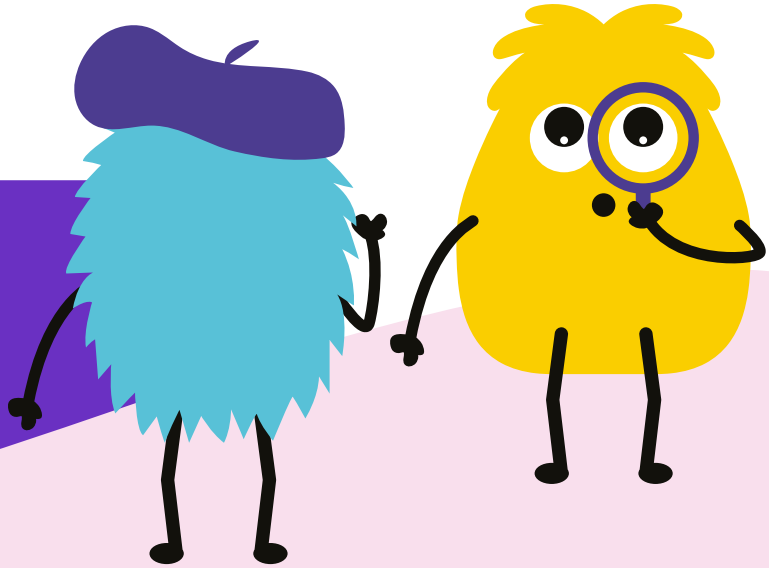
Teacher Links

- Understand how technology is used for health and inclusion atadastral.co.uk/go/dit01
- Accessible Adventures in Coding - learn about the importance of accessibility in the technology we use atadastral.co.uk/go/dit02
- Culturally relevant pedagogy for computing education atadastral.co.uk/go/dit03
- Women in STEM Posters atadastral.co.uk/go/dit04

Find Out More

- Hello World – Download your free issue all about Inclusion & Diversity atadastral.co.uk/go/dif01
- Exploring how culture and computing intersect atadastral.co.uk/go/dif02
- Computing for everyone - take time to understand the issues around diversity in computing atadastral.co.uk/go/dif03
- The best computer science and innovation arise when the best people of whatever gender, culture, sexuality, ethnicity and background work together atadastral.co.uk/go/dif04
- LGBTQ+ People in STEM atadastral.co.uk/go/dif05

Activity 1



Guess Who?

This is an activity you're going to do with the entire class. You may have played the popular board game version before?

The purpose of this game is for you to all learn a little more about the other people in your class. It may help to start new conversations, form new friendships, or help people to feel more included within the group.

Kit List

- **Paper**
- **Pens or Pencils**

Instructions

1 You all need to think of one interesting fact about yourself that you think other people may not know about you.

It could be your favourite sport, a cool experience you've had, something about your family, a favourite holiday destination or the thing you'd most like to do in your life.

2 Write this down on a piece of paper and write your name alongside it.

3 Hand this piece of paper into your teacher.

4 Your teacher needs to select two people from the class who will play the role of the **Guessers**. The **Guessers** will be asking the questions.

5 Your teacher now needs to choose one of these pieces of paper at random, but they can't show this to the rest of the class (the bit of paper selected can't be from either of the two people playing the role of **Guessers**).

6 Everyone who is playing (that isn't a **Guesser**) should stand up or start with their hands up in the air.

7 The aim of the game is for the **Guessers** to ask questions which will narrow it down to find out who the fact belongs to in the class.

a. If the question doesn't apply to your fact, you should sit back down again or lower your hand(s).

b. If everyone puts their hand(s) down, you can start that round again and ask a different question once those people who were left have put their hands back up.

Guesser 1 asks the first question, then **Guesser 2** will ask the second question, then back to **Guesser 1, Guesser 2** and so on until you're left with the last person who is standing or has their hand(s) up. The interesting fact must therefore belong to them!

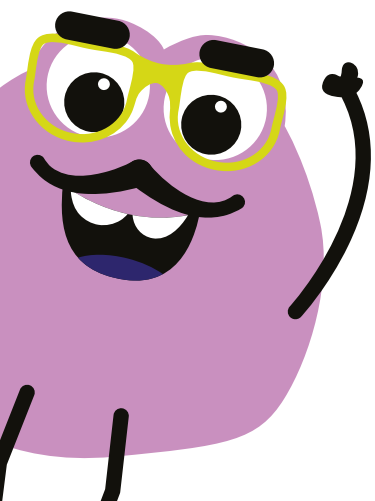
You should only ask questions that result in a 'Yes' or 'No' answer. Try asking questions like these, hopefully these give you an idea of what you could start to ask to narrow it down.

- "Is this fact about your family?"
- "Is this fact about your hobbies?"
- "Is this fact about sport?"

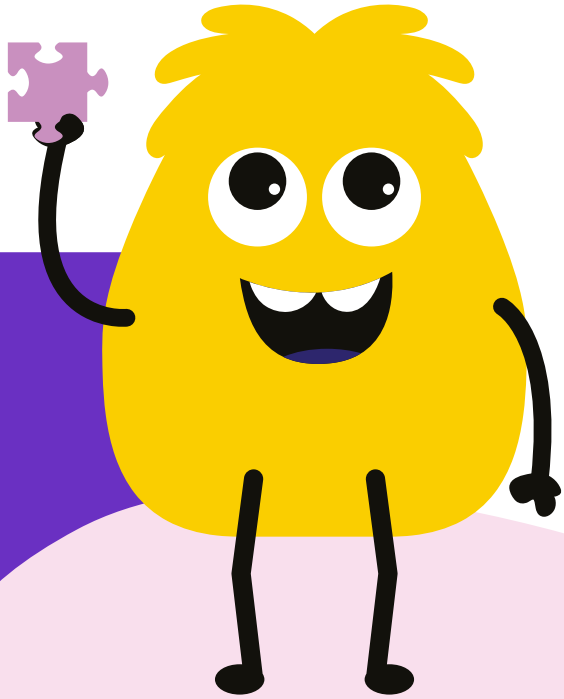
8 Whoever narrows it down to find the person that the fact belongs to wins the game.

9 That person then becomes one of the **Guessers** for the next round and you can play again and again (with the same interesting facts, or new ones), learning more and more about each other in the class.

After the game(s) have finished, maybe you could spark up a conversation with someone you haven't spoken to in a while about their interesting fact. Life is all about learning and keeping an open mind to everyone's interests, beliefs, and values.



Activity 2



The People Project

This next activity is more of a solo task, although you will need to initially pair up.

It is a research project aimed at finding out even more about your other classmates. The Guess Who game in Activity 1 was a start, but this activity is about going deeper and finding out even more about everyone in the class.

Kit List

Paper or a Computer

Coloured Pens or Pencils (if using paper)

Instructions

1. Your teacher should get you to partner up with someone else in your class.

2. In your pairs, sit down for a period of time and ask each other lots and lots of questions.

   Find out things like their birth date, where they were born, names of family members, their favourite hobbies outside of school, any religion or faith they have, their beliefs on topics they are passionate about.

   Ask all of these questions and more to try and find out as much information about your partner as possible.

3. Now it's time to write up your findings. Create a detailed report about your partner to showcase all of the information you've learned about them.

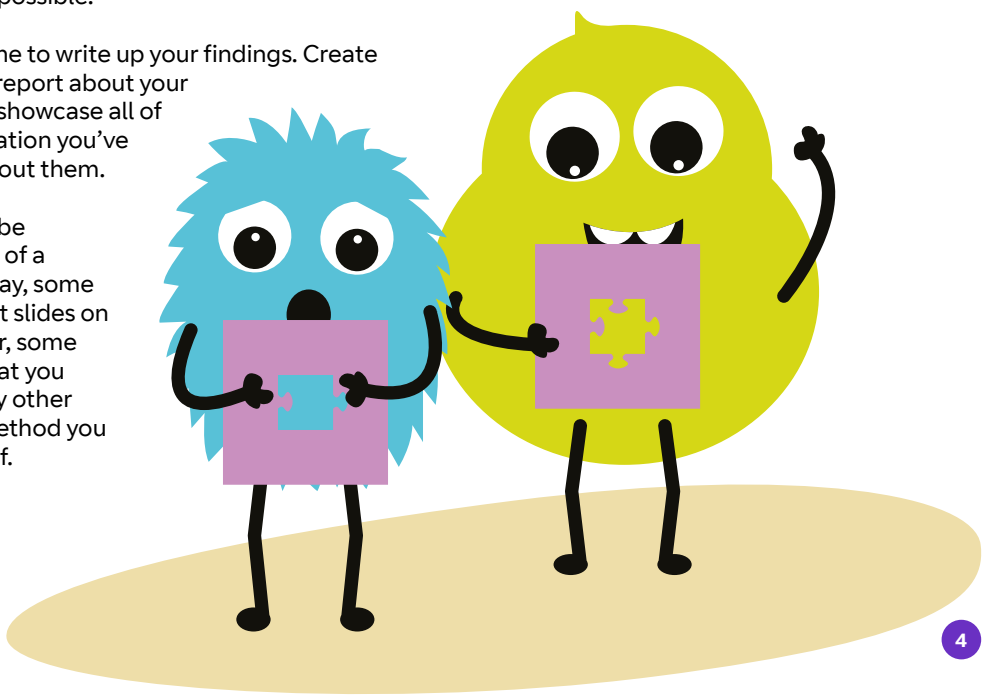
   This could be in the form of a written essay, some PowerPoint slides on a computer, some pictures that you draw or any other creative method you can think of.

4. You should then present this back to your partner to make sure that what you've recorded is accurate. You should also make sure that they're happy with what you've included in your findings.

5. One by one, you should present what you have found out about your partner to the rest of the class.

   The idea of this exercise is that you will learn lots of new, interesting information about your classmates, and learn to accept people for their similarities and differences.

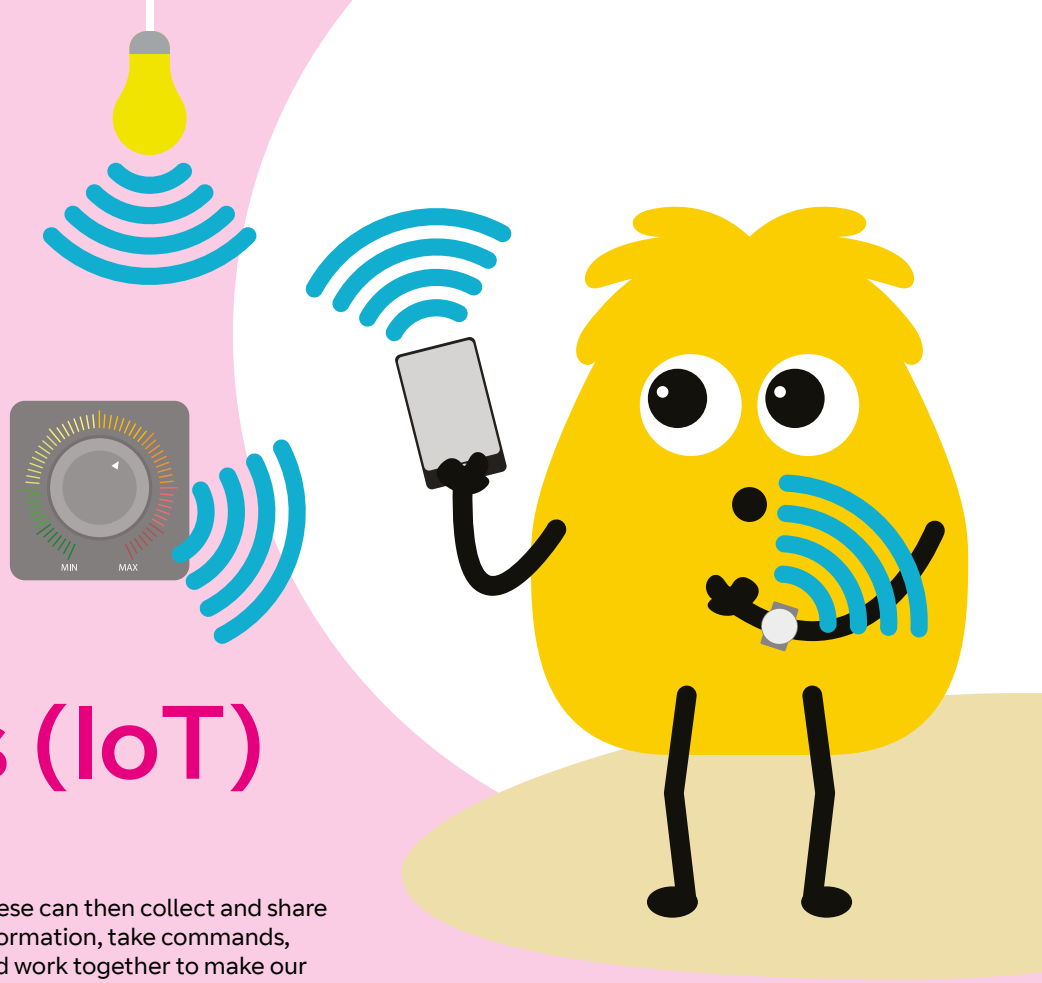
   By doing this and keeping an open mind to everything you learn, you'll make your classroom a supportive space where everyone feels that they belong. Therefore creating a more inclusive environment!



British Science Week

Internet Of Things (IoT)

activity pack



Internet Of Things (IoT)

Imagine a world where your everyday objects at home or school can talk to each other... making our lives easier, more connected, and a whole lot more exciting! Well, the Internet of Things, or IoT for short, is about connecting these objects to the internet to do just this.

Picture this... your fridge sending a message to your phone to let you know when you're running out of your favourite snack. Or your alarm clock not just waking you up, but also switching on the kettle or turning on the heating.

With our devices communicating and working together via IoT, our lives can become smarter, more convenient and even more efficient.

How does it work? Well, it's all about sensors, tiny computers and internet connections embedded in everyday objects or devices.

These can then collect and share information, take commands, and work together to make our surroundings smarter and more responsive.

Whether it's your smart home devices or wearable tech, they all become part of this interconnected web, making your life more fun and efficient.

IoT could help to make the world a better place. Imagine a smart city where traffic lights change based on live traffic data, reducing queuing and pollution. Or think about farmers working on a smart farm using sensors to take better care of their crops and animals.

There are so many possibilities, so what item would you like to be 'smart' and part of the Internet of Things? How would it help you in your life at home or school?

We'd love to see pictures of you all getting involved with the activities. Email these to us at **computerscience@bt.com** telling us which school you're from.

Or post it on social media and mention @adastralpark with the hashtag #BSW24.

Find Out More

- Hello World – Download your free issue all about The Power of Data
  atadastral.co.uk/go/iotf01
- Microsoft - Learn Internet of Things (IoT)
  atadastral.co.uk/go/iotf02

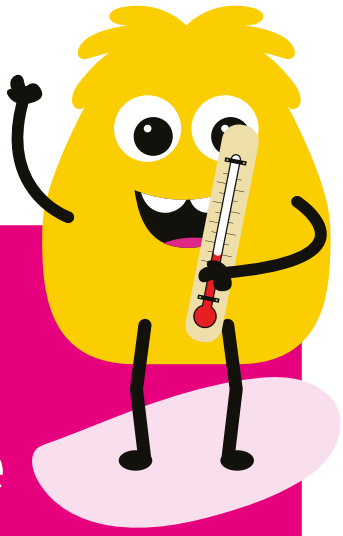
Teacher Links

- STEM Learning - How can we live smarter?
  atadastral.co.uk/go/iott01
- Barefoot Computing - Programming input devices in Scratch
  atadastral.co.uk/go/iott02
- BBC micro:bit - Helping plants grow
  atadastral.co.uk/go/iott03
- BBC Micro:bit – Healthy Oceans
  atadastral.co.uk/go/iott04

Have A Go

- Introduction to micro:bit: sensors, buttons and lights!
  atadastral.co.uk/go/ioth01
- Raspberry Pi - Build your own weather station
  atadastral.co.uk/go/ioth02
- Micro:bit - turn your micro:bit into a meteorologist that can display the weather forecast
  atadastral.co.uk/go/ioth03
- Scratch - make an interactive water usage calculator
  atadastral.co.uk/go/ioth04

Activity 1



Taking The Temperature

Just like a thermometer, your micro:bit can tell the temperature (how hot or cold it is).

It does this by checking how hot its processor (main computer chip) is on the back of the micro:bit. The micro:bit doesn't usually get very hot, so the temperature of the processor is normally close to the temperature of the environment.

It is measured as a number in degrees Celsius (often seen as °C). It can show this number on the LED display.

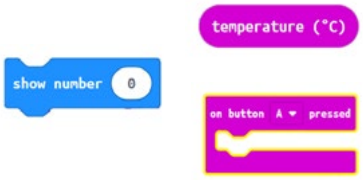
Kit List

- Computer with internet connectivity
- BBC micro:bit v2*
- USB to micro USB cable

Challenges

1 Display the temperature

a. On a web browser, go to MakeCode for micro:bit (https://makecode.microbit.org).
b. Start a 'New Project', give it a name and click 'Create'.
c. Can you arrange these three blocks of code below to get your micro:bit to show the temperature when you press Button B?



d. Test it out on the simulator on the left-hand side first.
e. Did it work as expected? If so, then download it to your micro:bit and try it out for real. If it didn't, try to troubleshoot it.

What is the temperature of the room you're in?

This block below is a Variable, meaning the value of it can change.

It stores the value of the temperature as a number, in degrees Celsius (°C). That number can go up if it gets hotter or down if it gets colder.

Every time the micro:bit runs this block of code, it asks the temperature sensor on the micro:bit "*what is your current temperature?*" and shows that.

2 Repeat Loop

What if you wanted to measure the temperature in a room more than once?

Rather than having to press the button on the micro:bit to show the temperature every time, there must be a better way...

Introducing a Repeat Loop means you can repeat commands as many times as you choose e.g. once, twice, ten times.

a. By adding these two blocks to your code from Challenge 1, can you modify your program to measure the temperature three times with a 5s gap in between each reading?

b. Remember to test it first and if it works, then download it to try it out for real.

3 Forever Loop

Repeat loops are great, but they stop after the set number of repeats. What if you wanted to monitor the temperature constantly?

This is where a Forever Loop comes in.

a. Can you modify your code with this block below, to measure the temperature constantly with a 1s gap in between each reading?

b. Test it and download it.

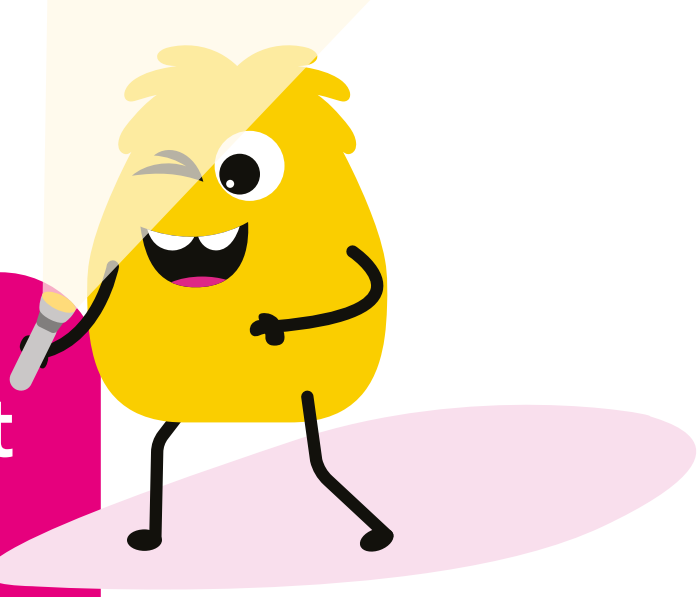
4 Bring the heat!

Now that we can constantly measure the temperature, let's see if we can watch the temperature change.

a. Gently put your finger on the processor on the back of the micro:bit and hold it there. The processor is also called the CPU (Central Processing Unit).
b. What's happening to the temperature now?

**If you don't have a physical micro:bit, then don't worry, you can still complete these activities using the simulator on the free website https://makecode.microbit.org. It won't give you the full, real-life experience, but you can still code it and test your program!*

Activity 2



Show Me The Light

A sensor is an input device which detects or measures something and responds to it.

A light sensor measures light levels and responds to them. For example, streetlights often have a light sensor to save electricity:

- **If they detect enough light, they keep the streetlights off.**
- **If they do not detect enough light, they turn the streetlights on.**

The micro:bit can act as a light sensor; it uses the LEDs to sense the levels of light on them.

Kit List

Computer with internet connectivity

BBC micro:bit v2*

USB to micro USB cable

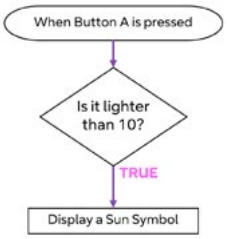
Challenges

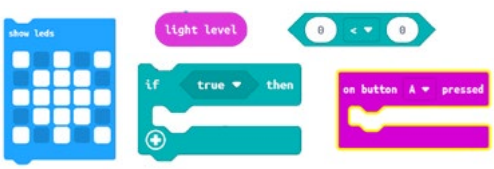
1 If, Then...

To configure our micro:bits as a light sensor, we need to help it to make some decisions – so it can tell whether something is TRUE or not.

These are called Conditions (selecting what to do depending on the answer to the question).

a. On a web browser, go to MakeCode for micro:bit (https://makecode.microbit.org).
b. Start a 'New Project', give it a name and click 'Create'.
c. Use these 5 blocks of code below to create a program for this algorithm:





d. Test it out on the simulator on the left-hand side first.
e. Did it work as expected? If so, then download it to your micro:bit. If it didn't, try to troubleshoot it.

2 If, Then, Else...

Decisions with only one outcome are quite limiting though. Sometimes we want to do something whether the answer is TRUE OR FALSE.

We can do this by adding an ELSE clause to the IF statement.

It can then have two results, like our streetlight example from before:

Is it light outside?
IF this is true, then keep the lights off
ELSE turn the lights on

You're going to use this example above to make your own night light.

Night lights come on when the light sensor detects there is a low amount of light.

a. Use these blocks below to make your micro:bit into a night light. It should only come on when the light level is less than 1.
b. Remember to test it first and if it works, then download it to try it out for real.

**If you don't have a physical micro:bit, then don't worry, you can still complete these activities using the simulator on the free website https://makecode.microbit.org. It won't give you the full, real-life experience, but you can still code it and test your program!*

Activity 3

Count My Steps

You can also use your micro:bit to create your own step-counter, also known as a pedometer. The micro:bit has a motion sensor (also known as an accelerometer) which allows it to work out when you are taking a step.

See, they're clever little things these micro:bits!

Kit List

- Computer with internet connectivity
- BBC micro:bit v2*
- USB to micro USB cable
- BBC micro:bit battery pack

Instructions

1 a. On a web browser, go to MakeCode for micro:bit (https://makecode.microbit.org).
b. Start a 'New Project', give it a name and click 'Create'.

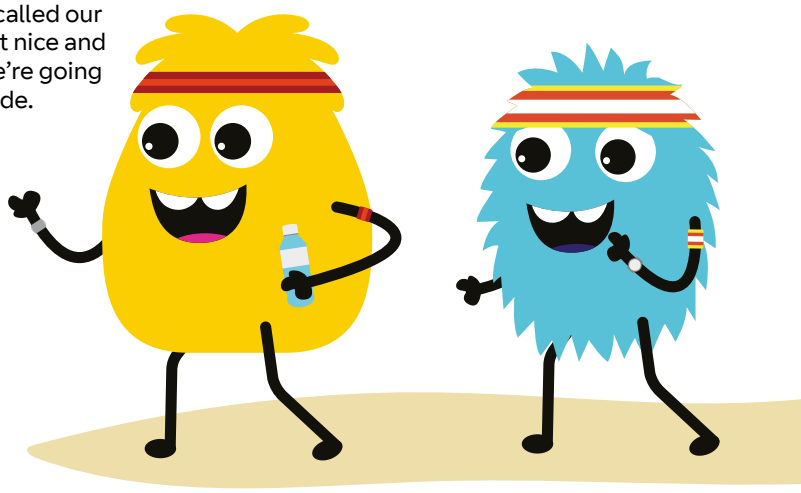
2 We now need to create a Variable which will record the number of steps taken.

Remember from Activity 1 that a variable is something that stores a value that is likely to change.

For example, we saw 'Temperature' as a variable before because the temperature goes up and down all of the time. If I were to ask you what the temperature is, you wouldn't say 15 degrees Celsius because that is what it was the last time you looked. Now it could be 10 degrees Celsius, 30 degrees Celsius or anything else!

a. Click on Variables > Make a Variable to create a name for your new variable before clicking Ok. We've called our variable Steps as it makes it nice and easy to understand how we're going to use it throughout our code.

3 Use these four blocks on the left to make a program that:
a. Sets your step counter to start at 0.
b. Shows that number on the micro:bit's LED screen.



The micro:bit will be attached to your foot, so that every time you take a step, the micro:bit will be shaken. Therefore, we want the micro:bit to record a step every time it shakes.

4 Add these blocks of code below to your program from Step 3 to increase your variable by 1 every time the micro:bit gets shaken.

Counting the steps is great, but we want to be able to see how many steps we've taken.

5 Modify your code, using these blocks below, to display the number of steps taken on the micro:bit's LED screen.

6 Test your code out on the simulator.

7 It's now time to download your code and try it out for real.

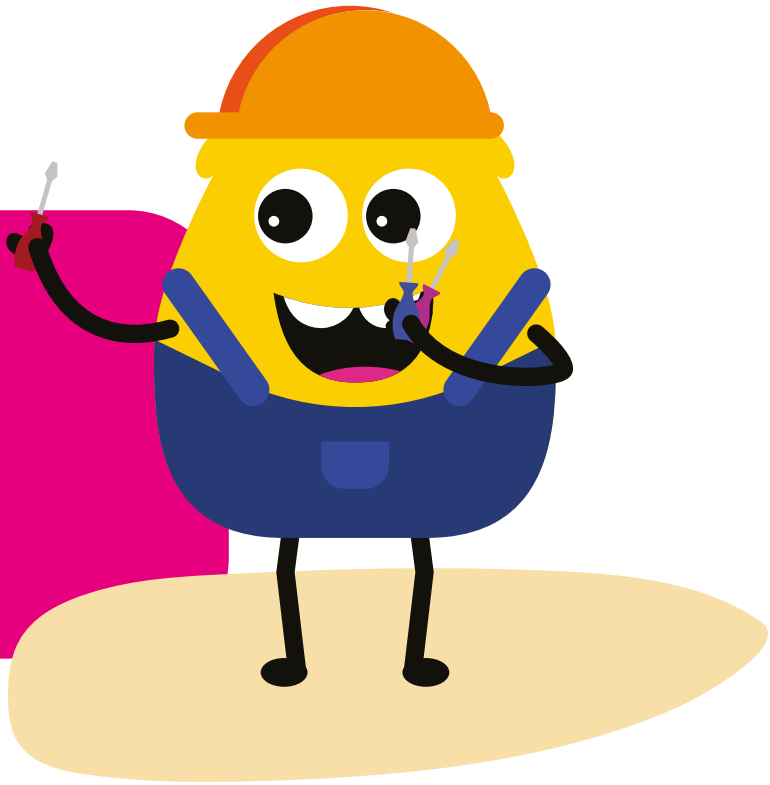
8 Connect the micro:bit battery pack to the micro:bit.

9 Secure the micro:bit safely to your shoe.

10 Press Button A on the micro:bit and start walking – how many steps does it take to get from one side of your classroom to another?

*If you don't have a physical micro:bit, then don't worry, you can still complete these activities using the simulator on the free website https://makecode.microbit.org. It won't give you the full, real-life experience, but you can still code it and test your program!

Activity 4



DIY IoT

Now it's time to get creative and design your own IoT device!

Here's what you've got to do:

Kit List

- **Print out Template on Page 7**
- **Pens or Pencils**
- **Colouring Pens or Pencils**
- **Materials that can be used to make a physical model of the IoT device e.g.**
  - ↘ Scissors
  - ↘ Glue
  - ↘ Sellotape
  - ↘ Cardboard
  - ↘ String
  - ↘ Straws

Instructions

1 **Define the problem**
What happens in your life now that you think an IoT device could help you with?

It might make your life better by speeding up a process. It might stop you from having to do something manually. Alternatively, it might just be a plain cool idea.

Have a think about how a device that collects data and is connected to a network could improve your life.

Write the problem down in a few sentences in box 1 of the DIY IoT Template from page 7.

2 **Design it**
Draw what your IoT device will look like in box 2 of the DIY IoT Template from page 7.

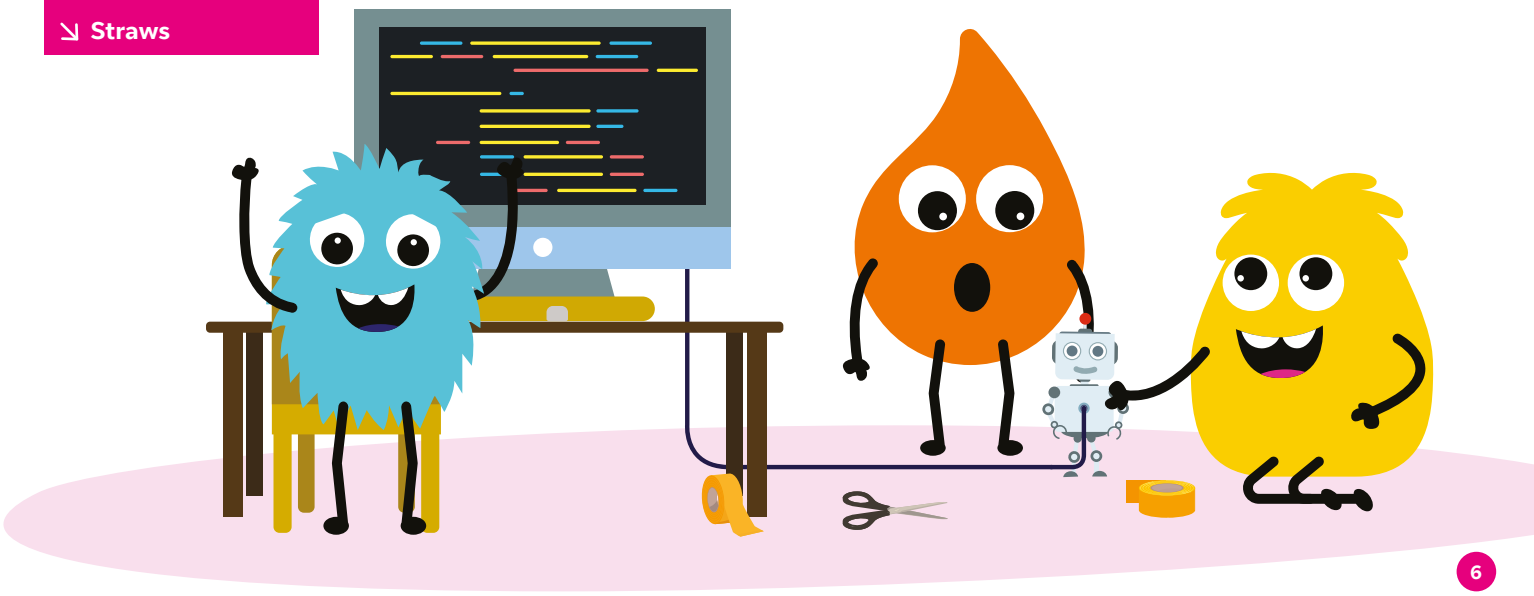
Make sure it's really detailed. Label all the key features to describe what they are and what they do.

3 **Make it**
Have a go at making your IoT device using the creative materials available to you.

Remember to make it look like what you have drawn and labelled in step 2.

Take a picture of your new IoT device. Print it out and stick it into box 3 of the DIY IoT Template from page 7.

4 **Send it to us**
We'd love to see your completed DIY IoT templates as well as pictures of your new IoT device. Email these to us at computerscience@ bt.com telling us which school you're from. Or post it on social media and mention @adastralpark with the hashtag #BSW24.



DIY IoT Template

1. **Define the problem (explain what problem you're trying to solve by creating your IoT device)**

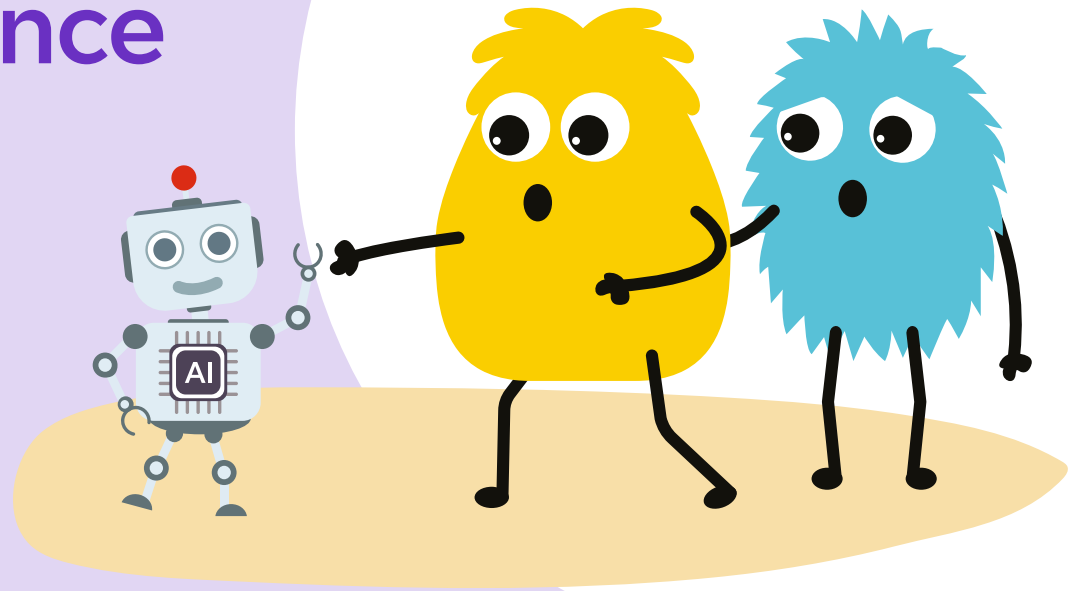
2. **Design it (draw an image of what your IoT device will look like)**

3. **Make it (include a picture of the IoT device you've now made)**

Artificial Intelligence (AI)

activity pack

Artificial Intelligence (AI)



Artificial Intelligence (AI) is a computer, or set of computer systems, that can perform tasks that would normally require a human's intelligence. These tasks include things like problem-solving, recognising patterns and learning from previous experiences.

One exciting aspect of AI is machine learning, where computers learn from data to improve their decision making over time. For example, you could teach a computer to recognise cats in photos by showing it lots of pictures of cats. As the computer looks at more data (pictures of cats), it becomes better at identifying cats more accurately.

A good comparison for AI is with us humans...

- Just like when we were really young, we were taught what things were by those who looked after us. With AI, this is similar, because we load 'training data' into the computer to tell it what a cat looks like for example.
- As we grow up we start to learn things for ourselves, from our mistakes or from what we read. With AI, this is where machine learning comes in. The computer starts to get better at a certain task by looking at more and more data related to that topic.

AI is an exciting, fast moving subject area that has the potential to transform the way we live, work, or go to school. But what are the possible consequences of creating machines that can think and learn? How do we ensure that AI is used for the benefit of us humans only?

We'd love to see pictures of you all getting involved with the activities. Email these to us at **computerscience@bt.com** telling us which school you're from.

Or post it on social media and mention @adastralpark with the hashtag #BSW24.

Teacher Links

- Artificial Intelligence: level 1 from STEM Learning atadastral.co.uk/go/ait01
- Introduction to Machine Learning and AI course from the Raspberry Pi Foundation atadastral.co.uk/go/ait02

Find Out More

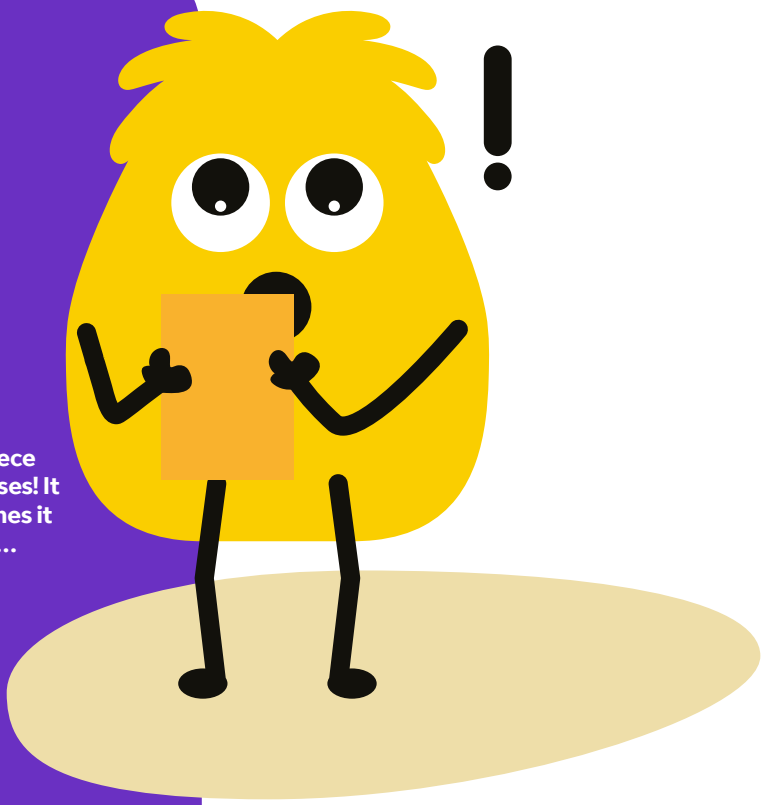
- Join Katie & Tex at TechSheCan to explore what Generative AI is atadastral.co.uk/go/aif01
- Hello World – Download your free issue all about Teaching & AI atadastral.co.uk/go/aif02
- Hello World – Download your free issue all about Machine Learning atadastral.co.uk/go/aif03

Have A Go

- Create an image identifier application atadastral.co.uk/go/aih01
- Train the computer to look for patterns in how your classmates get to school atadastral.co.uk/go/aih02
- Make a smart virtual classroom assistant atadastral.co.uk/go/aih03

Activity 1

Intelligent Piece of Paper



We're going to hold a competition for this activity!

<u>Human Vs AI</u>
The human will be: YOU!
The AI is called the Intelligent Piece of Paper.

Easy right? Well, let me tell you that the Intelligent Piece of Paper is unbeaten at the game of noughts and crosses! It hasn't lost a game yet. It has won roughly half the games it has played, and drawn the other half, but NEVER lost...

With confidence, it can be said that the Intelligent Piece of Paper is more intelligent than anyone in your classroom! Even smarter than your very, very intelligent teachers.

Do you believe it? If not, why don't you believe it? If you do believe it, what makes you think it's true?

Let's prove how intelligent the Intelligent Piece of Paper is.

Kit List

Whiteboard (or any large surface to draw a 3x3 grid on)

Whiteboard Pen (or anything to write with on chosen surface)

Print out the Intelligent Piece of Paper on Page 4

Instructions

1. Draw a standard, 3x3, noughts and crosses grid on the whiteboard at the front of the room.

2. The teacher will pick two people to play the first game. Each player will need a whiteboard pen.
   - One person will play on the side of the humans.
   - One person will play on behalf of the AI.

   As the Intelligent Piece of Paper doesn't have arms and cannot write for itself, one person will have to play on behalf of it and do exactly as the Intelligent Piece of Paper says.

3. When it is the AI's turn, the person playing for the AI needs to read the instructions on the Intelligent Piece of Paper out loud and do exactly as it says.

4. The person playing on the side of the humans can go wherever they like on the grid to try and beat the AI.

5. The AI must always start the game.

6. Follow the instructions from the Intelligent Piece of Paper on page 4 and play the game of noughts and crosses, good luck!

7. Keep playing more games. Different people can represent the AI, but make sure everyone gets a go at trying to beat the Intelligent Piece of Paper.

   Make a tally to record the number of wins for the humans, the number of wins for the AI and the number of draws overall.

   What's written on the Intelligent Piece of Paper is really just a computer program. It consists of a set of instructions that have to be followed in a precise order to achieve a task. It's an algorithm, and computers run by following algorithms. Computers ultimately follow a set of instructions that the computer programmers have given them.

   So it begs a bigger question... can something that just follows a set of rules really be called intelligent? What makes Artificial Intelligence, intelligent?

Intelligent Piece Of Paper
Template

I am the Intelligent Piece of Paper, nice to meet you, HUMAN.

Let's play a game of noughts and crosses.
I will be crosses (X) and you can be noughts (O).
I always go first.

Move 1:
Go in a corner.

Move 2:
IF the other player did not go there
THEN go in the opposite corner to move 1
ELSE go in a free corner.

Move 3:
IF there are 2 Xs and a space in a line
THEN go in that space
ELSE IF there are 2 Os and a space in a line
THEN go in that space
ELSE go in a free corner.

Move 4:
IF there are 2 Xs and a space in a line
THEN go in that space
ELSE IF there are 2 Os and a space in a line
THEN go in that space
ELSE go in a free corner.

Move 5:
Go in the free space.